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THE FOUNDRY

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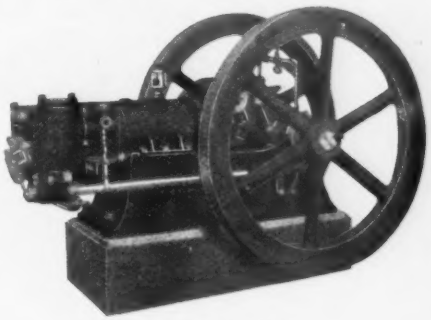

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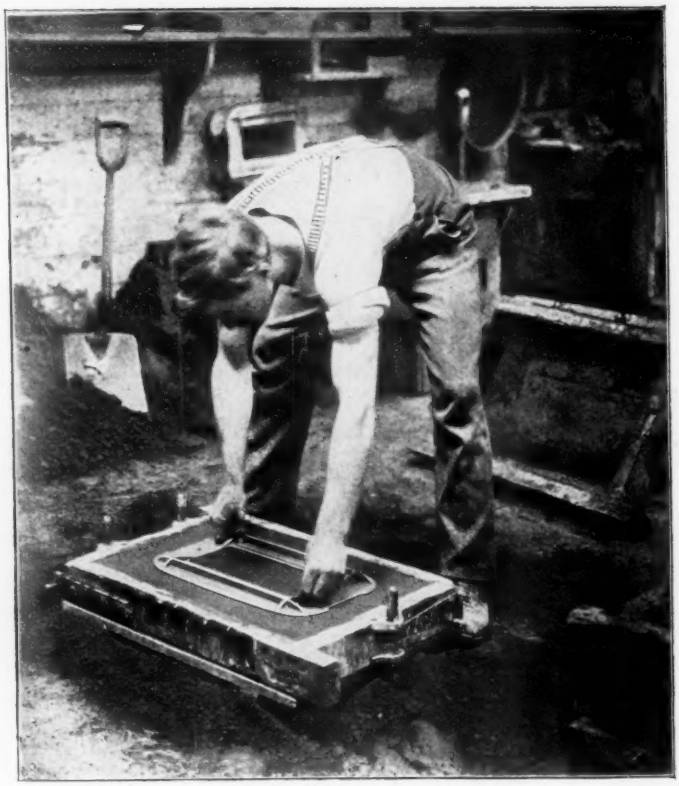

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We are placing hundreds of these machines all over the land—have dead loads of them in and around New York.

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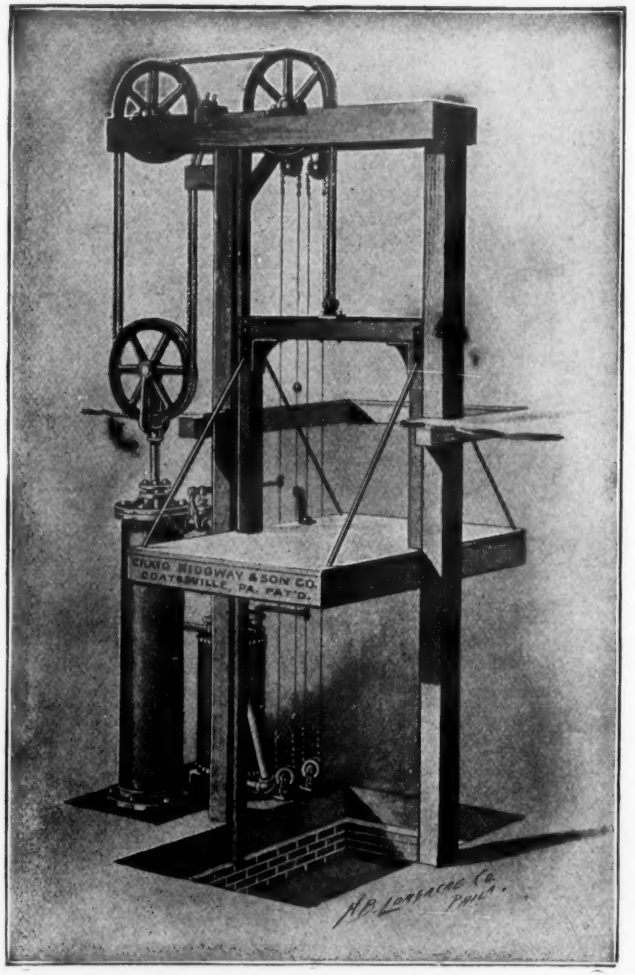
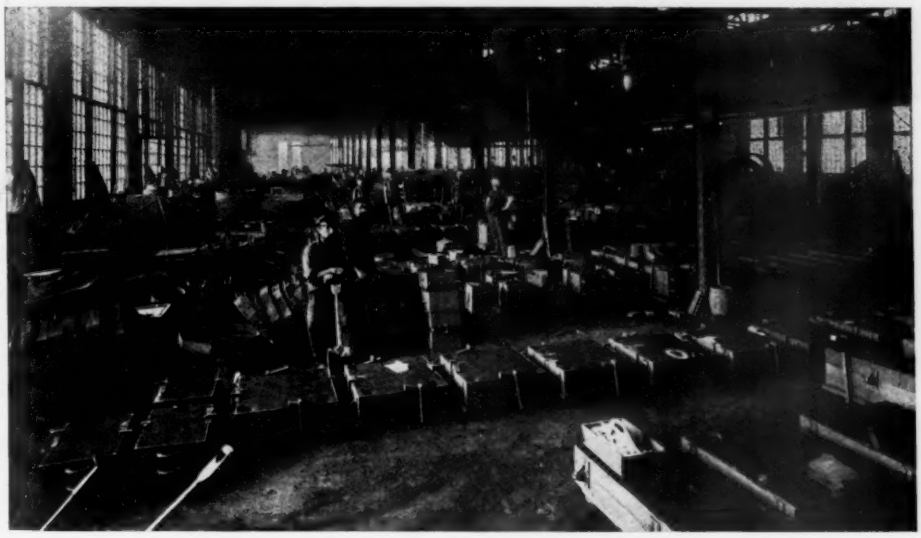


THE FOUNDRY

Vol. 27, No. 5. *CLEVELAND, OHIO, JANUARY, 1906.* *Whole No. 161*

Foundry Department of the Advance Thresher Co., Battle Creek, Mich.

The output of this company consists wholly of traction engines, harvesting and threshing machinery, and hence the work is specialized to a large extent. This is also a line in which there is a great deal of competition, and all points in the manufacture have to be considered very carefully. Taking all of these factors into consideration, the foundry has been designed especially for the work to be produced, and is an exceedingly good example of specialized foundry practice.



GENERAL VIEW OF FOUNDRY.

The foundry department is situated in a building 100 x 300 ft. with a cleaning room 100 x 100 ft. at one end, and two wings, one for the cupola house, sand and coke storage, and the other for the core department. The construction of the roofs of all of the buildings is interesting. The general arrangement is a flat roof, carried on steel trusses, with a series of skylights constructed on a saw tooth roof plan, which introduces ample supply of north light without a shadow. In the view showing the pig iron storage yard the saw tooth skylights can be seen on the main foundry roof. They can also be seen on several of the interiors.

The method of handling the pig iron and coke to the cupola has been carefully worked out. The iron is stored in a yard adjoining the railroad track at one side of the foundry. A transfer car travels the entire length of the yard upon a track which is sunk a few inches below the general yard level. The pig iron charges are placed upon small iron buggies, the construction of which is shown very plainly in the view of the charging platform, in which view the transfer truck used on the upper floor is shown at the left, with a box

BERLIN, GERMANY.

WHEEL FLOOR.

of scrap setting upon it. The small charging buggies are run on the transfer table and taken to the cupola house, and there raised to the charging platform by an elevator. In charging, all iron is gotten up onto the charging platform before charging begins.

PIG IRON STORAGE YARD.

Adjoining the charging platform on one end is the coke storage; the floor of the storage being level with the charging platform so that the coke barrows may be loaded and run directly to the cupola. The coke is put into the storage by an elevator at one end of the plant. The storage holds an entire winter supply of coke. Beneath the coke storage are situated the sand storage bins, which also have sufficient capacity to hold a winter supply of molding sand, seacoal, fireclay, etc.

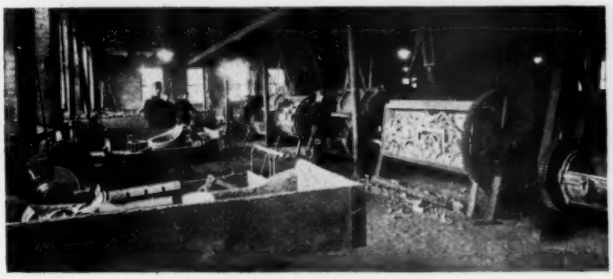
At present the foundry is equipped with one cupola, 66 in. inside of the lining. The blast is furnished for the cupola by a Connersville blower, belted to an electric motor. The cupola was manufactured by Byram & Co.

Next to the cupola, on one side, is located a ladle drying oven, which is constructed very much like a core oven, and it is used for drying both the large and small ladles.

While some fairly heavy work is made in this foundry, it is also highly specialized, and it has been found far more advantageous to use special hoisting appliances on the different floors and to carry the iron by a

trolley system than to use a traveling crane covering the entire foundry floor. By means of suitable switches and turnouts the trolley system is so arranged that the ladles going from the cupola to the floors never interfere with the empty ladles returning to the cupola. The arrangement of the tracks at the cupola is very clearly shown in one of the accompanying illustrations.

For handling the patterns, molds and castings on the individual floors, small hand-operated traveling cranes, connected with pneumatic hoists, are arranged to run on the lower cords of the roof trusses. These cranes travel across the foundry over the floors they are to serve, and in such cases the regular trolley system brings the iron to the floor and the traveling crane handles the ladle while the molds are being poured. In a system of this kind one crane is never in the way of another.



CLEANING ROOM SHOWING EXHAUST TUMBLING BARRELS AND GRINDING STAND.

CORE DEPARTMENT.

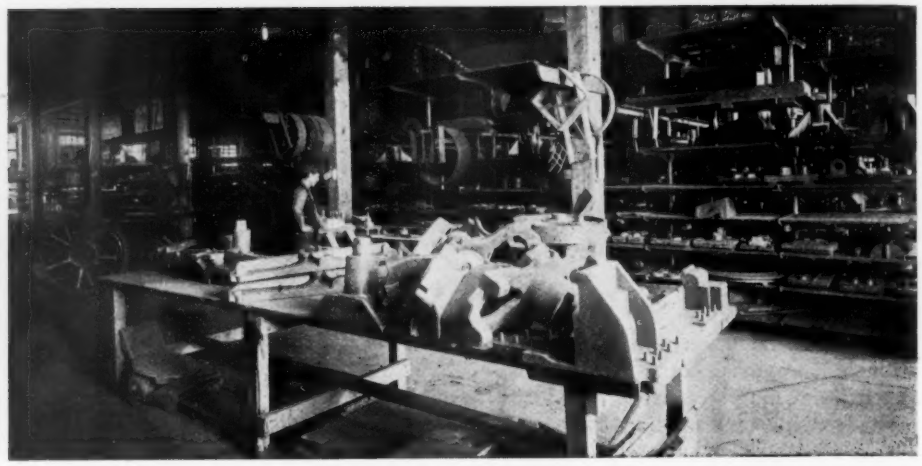
When the castings are shaken out, the large ones are taken to the cleaning room by the trolley system which is arranged with a slight grade toward the cleaning room situated at one end of the foundry. The small castings are put into suitable tote boxes, which are then taken by a hoist on the trolley system and run to the cleaning department. The scrap together with the sprues and gates are also thrown into the tote boxes, and taken to the elevator leading to the charging platform, where the boxes are placed on the transfer table and hoisted to the charging floor. On the charging floor a small section of trolley track, together with a triplex chain hoist, is provided for unloading such boxes.

The cleaning department, which is situated at one end of the foundry, is equipped with 16 exhaust mills, furnished by Byram & Co., of Detroit, Mich. These mills vary in size from 16 in. in diameter by 36 in. in length, to 4 ft. 6 in. in diameter by 4 ft. 6. in. in length. There are also six grinding stands with benches upon which the workmen pile the castings.

For convenience in handling the castings in the cleaning department, special trucks are provided. The trolley system also passes entirely around the cleaning barrels, so that they can be charged or discharged with the aid of the trolley system. In addition each pair of mills has an auxiliary trolley for handling the doors and placing the castings. The battery also contains one dry cinder mill for cleaning the dump.

CUPOLA CHARGING FLOOR.

The different floors of the foundry are fitted up specially for the different classes



PATTERN STORAGE.

of work. One of the most interesting jobs in the plant is the driving wheel job. These wheels are fitted with spiral cleats or sprockets cast on the outside of the wheel.

Some of these molds in various stages of completion are plainly shown in one of the accompanying illustrations. The interior portion of the wheel is made in green sand. The exterior is formed in a series of chills which are set up about the cores, surrounded with a suitable frame and backed up by ramming sand behind the chills. This produces a wheel with a chilled face which insures good wearing qualities. Over each of these wheel floors there are two hand traveling cranes. In all there are eight of these cranes in the foundry, each being fitted with a pneumatic hoist.

TROLLEY SYSTEM FOR CARRYING IRON FROM CUPOLA.

The core department which is situated in a bay at one side of the foundry is provided with two core ovens. The larger oven has a series of shelves around the outside and a car in the center. For lighting the oven, an arc electric light is suspended in front with a reflector on it which throws the light into the oven very effectively. Back of the large oven there is an oven provided with pipes through which the hot gases flow, and upon which the plates of cores are placed.

Adjoining the cleaning department at the front of the foundry are situated the foundry office and the flask shop. The flask shop is equipped with the necessary tools for making and repairing wooden or iron flasks. In the main foundry office provision is made for two clerks to look after the foundry accounting, and there is also an office for the foundry superintendent. On account of the fact that a large amount of duplicate work is made, it is necessary to check the production, and also the good and bad castings very closely, to prevent either shortage or over castings on an order.

Pattern Storage.

Over the cleaning department, flask shop and foundry office is located the pattern storage department. The floor of the pattern storage is of fire-proof construction and the room is separated from the foundry by fire-proof doors. The windows are made of wire mesh glass, and every possible precaution taken to reduce fire risks.

The patterns are stored on adjustable shelves, the shelves being supported on brackets, clamped onto pipe columns. All patterns with match boards are stored in this department, the large and heavy patterns being stored on the floor and the small ones on the shelves.

In connection with the subject of matches, it may be of interest to know that the match boards used in the foundry are made from the dust which is collected in the dust catching chamber into which the pipes from the exhaust tumbling barrels discharge. This dust is mixed with linseed oil and used in making the matches. The material has to be mixed a small amount at a time for the rapid oxidation of the oil which takes place heats the material rapidly and it soon sets and becomes useless. When this dust is used no litharge is necessary and hence the matches are of a very much cheaper construction than in the case of the ordinary oil sand match.

FOUNDRY GOLD BRICKS.

BY JOHN MCCUNE.

It is an old saying among crooks that there is a sucker born every minute, and they generally excuse their tricks by stating that these suckers have to be taken in or they are not happy, and it may be that in the evolution of affairs and the eternal fitness of things the gold brick man does succeed in quieting the minds of some of these unfortunately afflicted ones. In the world of finance gold bricks, mining stocks and various get rich quick schemes are easily disposed of among the class mentioned, and as this class hails from all ranks of industry we presume that occasionally a foundryman is caught by some cheap money scheme.

There is, however, a special class of gold brick tricks which have been invented to dazzle the foundryman alone, and the way in which some of these are worked is exceedingly interesting. To be a successful gold brick man in the foundry business, the operator must possess first of all a ready tongue and a pleasing and convincing manner. He needs a slight knowledge of foundry practice and a sufficient smattering of chemistry and metallurgy to enable him to season his remarks by lugging in a great many high sounding scientific words. When we hear some of these fellows talk we are reminded of the old Keeley motor joke, with its harmonious vibrations of ether, etc. etc., but Keeley is dead and so there is no danger of his invading the foundry field.

Nevertheless, there is no want of men who are ready to lift the foundryman's cash. There are two classes of these humbuggers. One is the class that deliberately sets out to Hornswoggle, and the other is a somewhat less dangerous class, who, in their own estimation make wonderful scientific discoveries and convince themselves that these should be passed on to the world and start out to enlighten their fellow foundrymen.

Several of these schemes have come under the writer's notice recently. The first is a scheme to "ozonize" the air as it is blown into the cupola. In this device potassium permanganate, which is always ready to give up a certain amount of oxygen, and other chemicals are mixed together and the air from the fan blown over them. It is claimed that the nascent oxygen converts the oxygen of the air into ozone, which is an especially active form of oxygen, and that it also increases the percentage of oxygen in the air. By this means less air has to pass the fan to produce a hot fire in the cupola. It is also claimed that the clinkers will not stick as badly and that everything will work freer and cleaner when this ozone process is used. Ozone is certainly a nice sounding word and one about which the fakir can build a pretty convincing line of talk and it is no wonder that some exceedingly good foundrymen who happen to have no knowledge of chemistry have been drawn in by this bait and swallowed hook, sinker and all.

The writer recently looked up a foundry where the device was being used and to his surprise, found that the management indorsed the scheme very highly. Though an attempt was made to find the trick by which this device was made to work, success did not crown the effort in this case. The trick, however, is an old one. Mr. Fakir enters the foundry, looks the cupola practice over and gets permission to install his device. Incidentally he discovers and corrects some errors in the cupola practice. This is sometimes done by bestowing

a $5.00 shinplaster on the cupola tender and getting him to be very careful about his charging and the carrying out of the work. In many cases the recipient of the V is not let into the trick at all, but nevertheless bends his every effort to try and charge that cupola just as the donator asked him to, and hence as long as the cupola is run by the same man the gold brick device is likely to be used and the royalty readily paid.

Now let us look at this ozonizing scheme through a pair of scientific spectacles. The cheapest supply of oxygen in the world is to be found in the air and in that form it is all ready to burn any carbonaceous material that comes its way providing the said carbon is raised to the proper temperature. In cupola practice the carbon is coke and when a sufficient supply of oxygen is introduced to the tuyeres the burning goes merrily forward. Now an atom of oxygen from other sources can burn no more coke than an atom of oxygen from the air. The only advantage it possesses is that it is not accompanied by a certain amount of the inert gas nitrogen. The specific heat of nitrogen is very low indeed, due to a beneficent provision of Providence and hence it does not rob the furnace of any great quantity of heat and carry it up the stack. The only effect heat has on nitrogen is to raise its temperature, as there is no chemical change in the case between high and low temperatures. Now to turn to the source of oxygen in the ozonizing process, we find that it must be obtained from the potassium permanganate or some other compound containing a large amount of oxygen, part of which can be freed by a chemical reaction. There is wonderful balance in chemistry and no reaction occurs without either an absorption or a liberation of heat and most substances have a tendency to absorb oxygen with the liberation of heat. Hence, when oxygen is again liberated from a body there must be an absorption of energy in some form and usually a considerable absorption of heat. The result is that the small amount of oxygen obtained from the chemicals charged into the fan is exceedingly expensive and can have practically no effect in increasing the efficiency of the furnace, as only a few pounds of the re-agents are used, which at best would give but a small fraction of a pound of oxygen. This, when compared to the total amount of oxygen forced in with the fan is scarcely worth considering, for the amount of oxygen necessary for running the cupola one hour, if it were in solid state and could be put on the scales, would be found to weigh more than the coke charged. It is also evident that this oxygen entering through the tuyeres can certainly have no effect upon the condition of the slag and would in no wise aid in producing a clean drop.

There is another gold brick man who is going around this country exploiting the old steam theory. His hobby is to blow superheated steam in through the tuyeres of the cupola and thus increase its output. It is very nice theory, but let us look at the practice a moment. What he claims is that at the high temperature of the cupola, the steam is disassociated into oxygen and hydrogen and that both of these play an important part in adding to the heat of the cupola, the hydrogen burning and the oxygen combining with the coke or the hydrogen to produce the necessary heat. Now water is nothing in the world but a combination of oxygen and hydrogen in the proportion of two atoms of hydrogen to one of oxygen, the formula being H_2O, hence the breaking up of one atom of water gives two atoms of hydrogen and one of oxygen. If the oxygen combines with some of the coke there is nothing left to burn the hydrogen, for when hydrogen burns it always forms water and nothing else. Of course, at the instant of combustion the water is intensely hot steam.

The practical result of this use of superheated steam seems to be that the water is actually broken up and that most of the oxygen combines with the carbon, while the hydrogen goes up through the coke and burns at the charging door, making an intensely hot flame which renders charging difficult. The hydrogen cannot combine with oxygen to form water at the temperature of melting iron, and hence none of the hydrogen can burn in the melting zone of the furnace, but must of necessity burn at some higher and cooler point. If this were not true, the water could not have been broken up into oxygen and hydrogen at a point below the melting zone. Hence, the effect of introducing superheated steam is, in the first place, the waste of a lot of coke or other fuel for making the steam. Second, the robbing of the melting

zone of heat to decompose the water, and third, the unnecessary heating of the stack and troubling of the man at the charging door by the burning of the hydrogen.

To offset this we have nothing on the other side of the ledger except a little oxygen to combine with some of the carbon and this will be found to be but a partial recompense for the loss incurred. The writer has been very much surprised to find practical foundrymen of great ability fooling with this old superheated steam bogy.

There are several other foundry gold brick men floating around that the foundry supply man bumps into in his travels, but the writer thinks that he has stirred up hornets enough for this time and will let the others off until a later date.

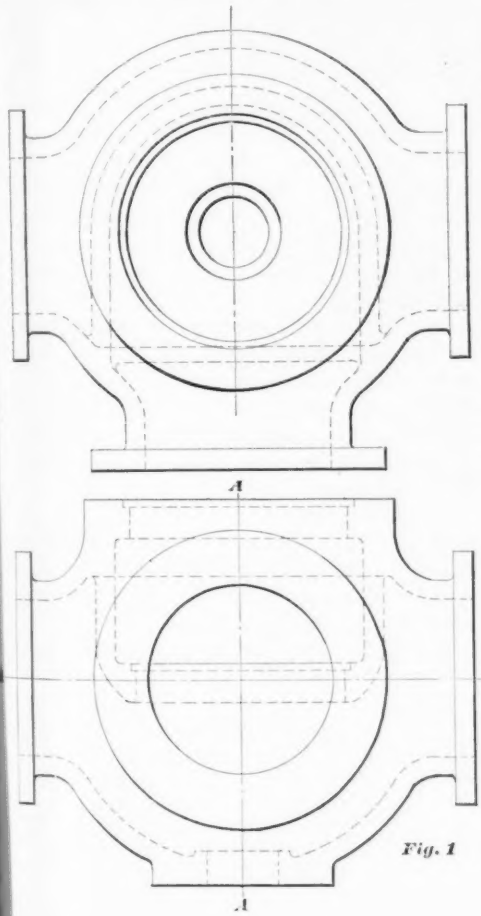


Fig. 1

The Southwestern Iron Co., of Guthrie, O. T., is about to equip its new foundry.

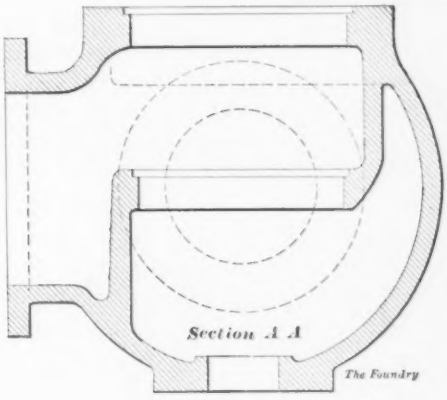
PATTERN FOR A THROTTLE VALVE BODY.

BY H. J. MCCASLIN.

While all valves are throttles, a throttle valve is generally understood to designate that design of valve used in regulating or controlling the steam supplied for reversible engines. These conditions usually require a quick action; hence, the valves are generally operated by levers. This necessitates the balancing of the valve so as to counteract the steam pressure, which changes the interior of body somewhat from that of an ordinary globe valve.

The valve body illustrated and described in this article is known as a three way, 12 x 12 x 14½-in. throttle valve. This particular design is frequently used in connection with a pair of heavy reversible blooming mill engines. Fig. 1 shows two views of the valve body, and also a section on the line A A ; this section being taken through the intake opening.

To many persons the interpretation of the valve body drawing is always a perplexing problem, but this problem has a comparatively simple solution, for with the aid of a sheet of carbon paper and piece of drawing paper, the outline of the core can be traced in each view together with their center lines. Now by folding these carbon sheets along their center lines and placing them in a vertical plane in their relative positions, with regard to the accompanying views, the results will be surprising, as it



will readily be seen what is required and the manner in which the cores can be made and placed together in the mold.

Before laying out of a full size section, and the commencing of the construction of such a pattern, its position and method of molding must decided upon.

This pattern might be parted in the plane of Fig. 2, which shows the completed pattern. This would, however, necessitate a loose flange and a more intricate core; or it can be parted as in the case under discussion at right angles to the plane—that is, vertically along the line B B, with the bonnet opening downward. This method of starting provides a convenient and positive manner of setting the cores as well as simplifying the construction of the core boxes.

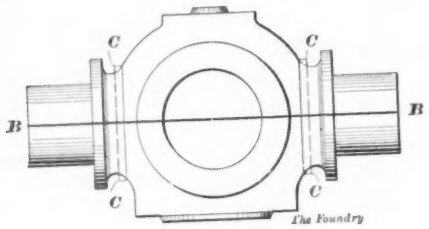


Fig. 2

Fig. 3 shows the cope and drag parts of the pattern built up of segments and ready for turning. These two parts can be dowled together or fitted together with a male and female joint. The former method probably being preferable, as it does not require the parts to be rechucked. After the parts have been turned separately, they are placed together, marked, and the dowled pin holes bored.

The manner in which the opening connections are built up in halves and turned is shown in Fig. 4. To avoid a feather edge, and also to assist in turning and gluing these parts to the pattern body, ample stock is left as shown at C, and afterwards worked off into the fillet. The core prints are shown in Fig. 5. The core prints and connections could be built up and turned entire, but it is more convenient to turn them separately and attach later.

Before proceeding with the discussion of the construction of the two core boxes with their detachable parts, let us familiarize ourselves more fully with the form and manner of jointing the cores required in forming the interior of the body. If the carbon tracings have been obtained, as heretofore explained, and are laid out in their relative positions to one another, they will appear, of course, without the joints and print portion. The assembled cores, together with

Fig. 3

a section of the mold, are shown in Fig. 6. The two half cores, D and E, forming one portion of the body, are made in the same box and are jointed in the vertical plain, or at right angles to the joint with core F or the parting of the mold. Cores F and G are jointed as shown, and are made from the same box—core F forming the drag portion of the body while core G forms the cope half of the intake opening. To assist in locating and setting the cores, D, E, and F together in the mold, a projection with corresponding depression is formed in the joint as shown at H.

In placing the cores in the mold, core F, with core G attached by pasting and wiring, is set in position. Cores D and E are next secured together in like manner and set upon the ones already placed.

The plan and three sections of the core

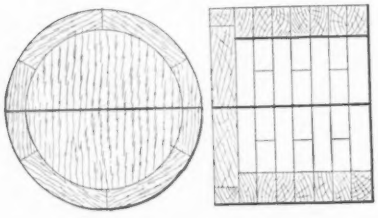


Fig. 5

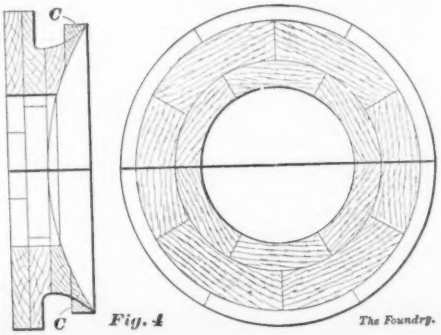


Fig. 4

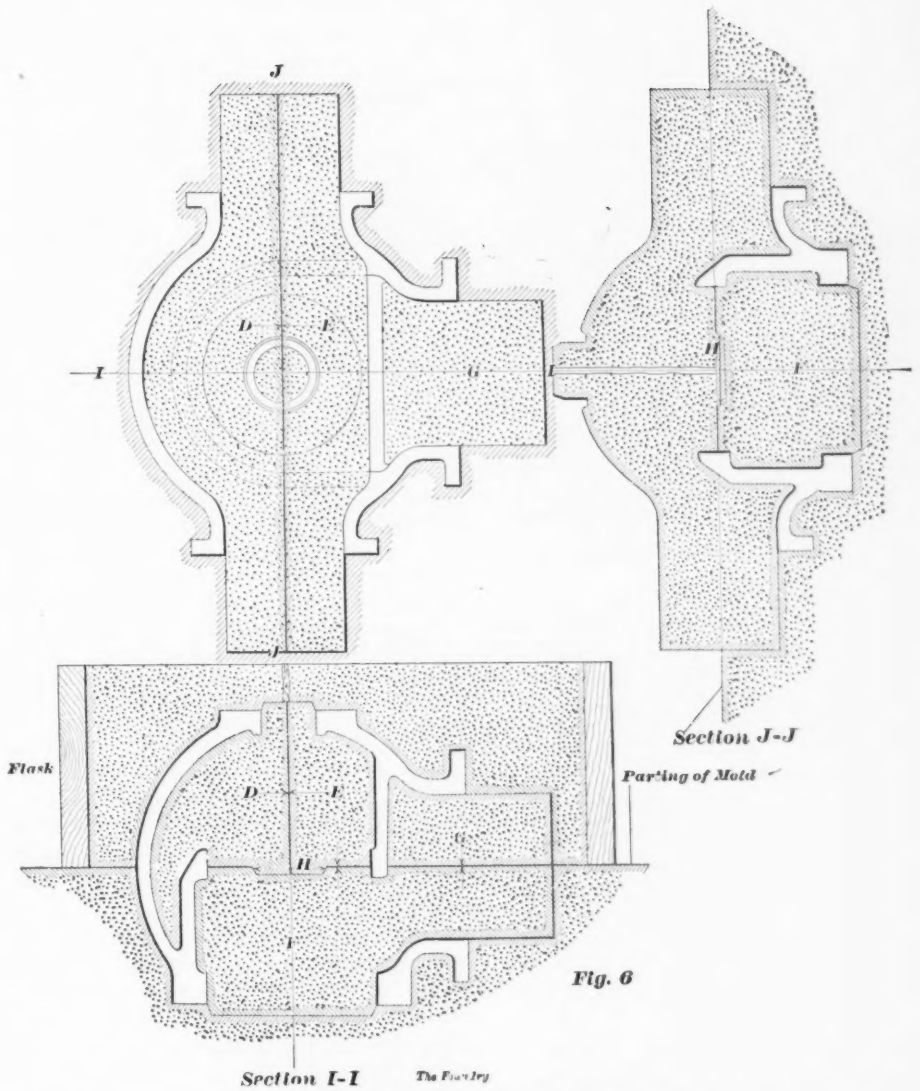


Fig. 6

box used in forming the cores D and E are shown in Fig. 7. The spherical portion of the box is built in segments and turned out. It is then flattened off as shown to receive the material forming the opening K, and also the board A B, to which is secured the parts L, Z and M, forming the valve chamber. The part M is shown in position in the lower right hand section, N O. As these two half cores, D and E, are made from this box, it requires the loose parts to be changed for each core—that is, parts L and Z are used in forming core D, while part M is substituted for forming core E.

Prior to the rolling over of this box, when forming core D, part Z is removed and piece L drawn back. The depressions left vacant by these two parts are filled with green sand to support the over-hanging portion of the core while it is being dried.

It will be observed that the part M consists of a board fitted into the spherical portion of the box to flatten it off, and to which is secured this portion of the valve chamber.

Cores F and G are formed in the box shown in the plan and sections in Fig. 8; the portion R, forming the lower part, being built up by segments, turned and secured to the frame S, which is built up, sawed out

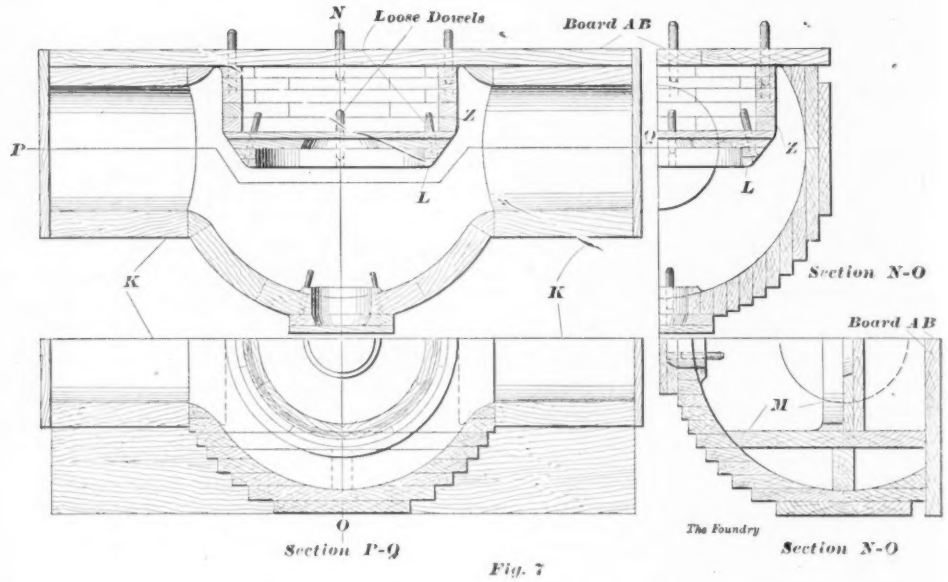


Fig. 7

and attached to the material T, as shown, so as to form the intake opening. This portion of the box is then dressed out with the aid of a templet to the proper spherical form as shown by the section U V. Plate W is dropped into the top of the box as shown to form that portion of the metal thickness of the valve chamber which extends beyond the center line of the valve body.

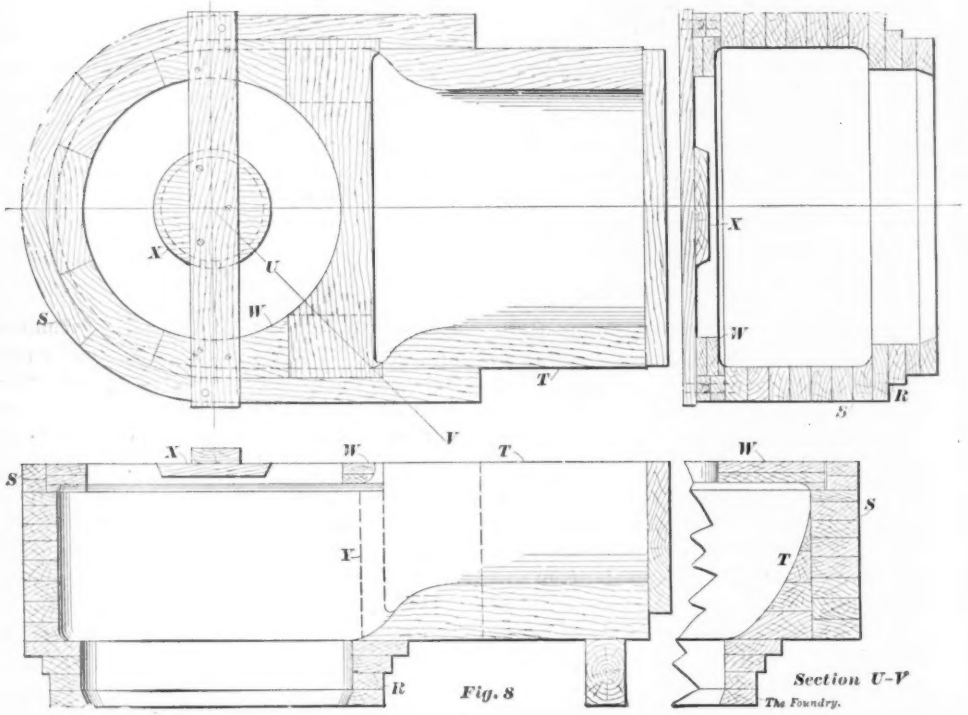


Fig. 8

Print X is suspended in the center of the opening and forms the depression H, shown in core F, Fig. 6. Core G is formed in this box also with the aid of the stop-off

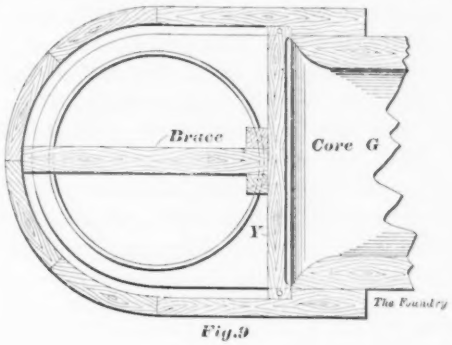


Fig. 9

piece Y, which is dropped into the box and braced as illustrated in a partial section of the core box shown in Fig. 9.

NOTES ON PIPE FOUNDRIES AND SUGGESTIONS ON METAL MIXERS.*

BY J. B NAU.

In this very interesting paper the author tells of experience which he had in visiting various European foundries and looking up foundry practice. In Europe pipe specifications do not call for cupola metal and hence, direct metal is used quite extensively. To obtain an even or uniform grade of metal the iron tapped from a number of furnaces is placed in a big metal mixer, which is heated somewhat after the manner of an open hearth furnace. Experience has shown that they can fulfill the most rigid pipe specifications with direct metal when treated in this way. He also states that in most cases they have provision for the introduction of cupola metal when it is desired. In one of the basic Bessemer steel works of Europe, the writer saw one of these mixers of 250-ton capacity. This was fired or heated with gas, so that the metal could be kept liquid for any desired length of time. In some of the German pipe foundries small non-heated mixers were used which were said to give good satisfaction and to be able to hold the iron as long as two hours before pouring. He points out the fact that in a heated mixer, while a small proportion of the silicon might be burned out, the effect would not be so severe as in an air furnace in which pig metal or scrap is melted, on account of the fact that the greater portion of the loss takes place during the melting, and that by introducing molten metal into the mixer the silicon and other ingredients are protected. He points out the fact that in a heated metal mixer the composition of the iron could be corrected by introducing cold pig iron and melting it down in the liquid bath in the mixer.

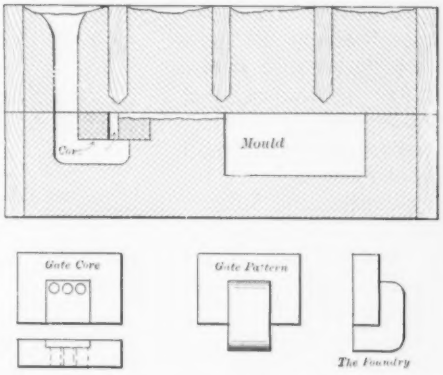
He also touches upon the fact that the molds in European pipe foundries are not placed in pits, but that elevated floors are used to which one-half of the mold is attached and the molds never removed from their normal position, the outer half only being removed or slid back to allow the pipe to be lifted out after casting.

*Review of paper read at A. F. A. Convention, New York City, June, 1905.

A STRAINER GATE.

BY O. B. CECIL.

The accompanying illustration shows a strainer gate which I have been using recently. I had occasion to make some fine grade castings, and found it almost impossible to produce them until I designed this gate and put it to use. Since then, I have had no difficulty whatever in obtaining good, clean castings. The illustration is self-explanatory and shows all of the details. I wish to give this to the public through *The Foundry*, as I am sure it will be of use to a great many foundrymen. Perhaps it may be in use elsewhere, if so, I have never seen or heard of it.



A STRAINER GATE.

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TRADE OUTLOOK.

The trade conditions still continue as favorable as they have been reported during the last few months. Comparatively few orders for pig iron have been placed recently, but this is largely on account of the fact that most of the furnace interests are sold for several months ahead and that many of the large producers have covered at least their immediate requirements. Very few foundrymen are requesting a delay in the shipment of pig iron contracted for, while many of them are urging shipments in advance of the stipulated time of delivery. This and many other features of the present conditions show that the consumption of pig iron is at present at a very high rate. On the other hand, the furnace production is also at an exceedingly high rate. The cessation of buying which has come recently occurred in time to prevent a runaway market. There have been comparatively few large sales of foundry pig iron during the past month. At Pittsburg, however, one sale of 20,000 tons was made on the basis of $18 for No. 2 foundry, the metal to be delivered during the third and fourth quarters of the year.

In the North, in the Pittsburg district, No. 2 foundry iron is quoted at $18 at the valley furnaces, while in the South No. 2 foundry is quoted at from $14.50 to $15 per ton Birmingham. In the Chicago district Northern No. 2 is quoted at from $19.50 to $20 per ton.

The foundry business throughout the country is certainly in excellent condition. The majority of the foundries are working full time and some of them over time. One notable feature of the present situation is the large amount of building, enlarging, and improvement going on at the present time, and the open weather during the fall has been very favorable for this class of work.

The molding sand people have been unusually busy with late shipments trying to supply their customers with the extra large quantity of sand required for the busy winter before most of the foundries.

The open fall and early winter weather has also been very favorable to the shipment of coke, pig iron, and other foundry supplies and has greatly assisted the railroads in moving their large tonnage of

freight, which of necessity must be handled before freezing weather sets in. Freight delays, however, have seriously hampered some plants, and on a recent trip while visiting a number of the larger foundries, the writer found several plants at which a sufficient tonnage of pig iron was contracted for to supply the plant for the entire winter, but in some cases plants had to stop operations for a number of days at a time, owing to the fact that the railroad could not supply the iron as fast as it was required.

BRASS FOUNDRY DEPARTMENT.

The Foundry has always represented all departments of metal founding and from time to time various changes in the management of different parts of the paper have been made to keep pace with the development in the different sections.

We have for some time been intending to devote more specific attention to the casting of various alloys, and in fact, all metals other than iron and steel. In accordance with this policy we have collected all of the articles relating to brass, bronze and alloys in one part of the present issue of the paper and this brass foundry section will in the future be a regular feature. It will be noticed that the total number of pages of reading matter have also been increased to give us more space to devote to the non-ferrous metals. It is probable that very few branches of the complex industries of this country are advancing more rapidly at present than the foundry and it is our aim to keep pace with the latest foundry practice. Arrangements have been made for special articles in all of the different branches of the foundry field including malleable iron, steel castings, various phases of gray iron casting, and other subjects of interest in the iron and steel foundry business which will appear during the coming year. This means that *The Foundry* will in the future publish more articles on iron and steel subjects than in the past and in addition will devote special attention to the casting of alloys.

We are also especially anxious to obtain good live articles from any one who has matter to impart which is of interest to foundrymen in general and to those engaged in the brass, bronze and alloy foundry business in particular. The editor of *The Foundry* will always consider it a favor if any one engaged in the foundry business will write stating subjects upon which he would like to see articles and making any suggestions for the good of the paper.

VARIETY IN READING.

There is an old saying that one man's meat is another man's poison and the editor certainly has cause to know this more fully than almost any other individual, for it is extremely difficult to please all classes of readers. From time to time we have received a great many letters asking why we did not publish more articles written in a light or humorous vein which could be taken as seasoning to the heavier articles presented in the paper.

This matter is brought forcibly to our attention by an article and an editorial appearing in the December number of *Wood Craft*. The editor of that paper had published several articles in a light vein, some of which contained cartoons. These provoked considerable comment from different parties, and one of the readers strenuously objected to the publication of any such thing in the paper. The writer of the article referred to likens the heavy or technical articles to meat and the lighter articles to vegetables. He then calls attention to the fact, that a boarder who is discontented with the board and at the same time a meat eater, usually stays and grumbles, while the man who knows just what he wants in the line of variety goes where he can get variety. He states that he, for one, wants his vegetables with his meat. In the editorial there is a quotation from the author of the article taken from a letter which accompanied the article. The quotation is as follows: "Cucumbers, radishes and raw tomatoes may be trifling foods, but I hate oatmeal, Uneeda biscuits, and all the vaunted health provisions, and so do most of my acquaintances."

We are very glad indeed to see one practical man come out and state in plain English what he likes in this matter and call attention to the value of these articles, written in a lighter or more humorous vein.

In the July issue of *The Foundry* in

connection with the description of the American Foundrymen's Association Convention in New York, we printed a number of cartoons, illustrating some of those who took part in the meeting or pointing out various matters of interest which occurred during the meeting. About two weeks after the issue had been mailed we received two letters from England, both coming in the same mail. One of the writers said,—"You may discontinue my subscription to *The Foundry*, for I do not care to subscribe for a paper, which can descend to the comic valentine style." The other enclosed a money order for his subscription and commented very favorably upon the issue stating that he considered the cartoons an improvement on the method in which the description of the convention was handled the previous year. Some forty or fifty letters were received from different parts of the world, commenting on the convention issue. A number of them were from new subscribers, though more than half of them came from those who had taken the paper for a great many years and but two writers had anything but words of commendation. We do not believe that there is any one, who would care to have all of the fun removed from his life, and since funny things are constantly occurring in the foundry, why should they not have a place in foundry literature?

The writer is reminded of a certain teacher's experience, who one day said: "God bless the poor student! He is the fellow who helps me out a great many times." The professor in question was teaching in a small Western school where he had to burn a great deal of midnight oil in correcting his papers, preparing his lectures, etc. By the time he had ground over thirty or forty good examination papers, he would be pretty tired and then he would strike one from some poor student, who nevertheless had a humorous vein or possibly just blundered on to humor through not knowing any better. The ridiculous mistakes would result in a good laugh which cleared the wrinkles from the tired professor's face and the cobwebs from his brain, so that he was good for a couple of hours more of hard work.

We believe that in like manner an occasional humorous article serves as seasoning with the solid food of the technical journal and we will always be glad to welcome such articles when we have room to publish them.

METALLOGRAPHY APPLIED TO FOUNDRY WORK.—V.

BY ALBERT SAUVEUR.

The Microstructure of Cast Iron.

In the first four installments of this article the apparatus and manipulations required to prepare, examine and photograph samples of cast iron with a view of studying their microstructure, have been briefly considered and I may now pass to a description of these structures.

It is well known that the carbon present in cast iron may exist in two distinct forms, (1) as free or "graphitic" carbon and (2) chemically combined with some of the iron forming the carbide Fe_3C, a compound

FIG. 1. GRAY CAST IRON FROM SALAMANDER MAGNIFIED 50 DIAMETERS (ETCHED).

which contains 6.67 percent of carbon and 93.33 percent of iron—and it is also well known that the physical properties of any cast iron depend primarily upon the relative amounts in which these two varieties of carbon are present.

In some cast irons the totality of the carbon may occur as graphite while in others it may wholly be present in the combined form. Between these two extreme types numerous grades of cast iron exist containing both graphite and combined carbon in varying proportions, and with correspondingly varying physical properties.

Those cast irons which contain most of their carbon as graphite are called grey cast

irons because of the dull grey or blackish appearance of their fracture, while those in which the whole of the carbon is combined are known as white cast irons because of the bright metallic luster of their fracture.

The well known causes to which the formation of these two distinct kinds of carbon are due will be alluded to on an other occasion, it being desired for the present merely to describe the structure of these various grades of iron as revealed by the microscope.

The structure of a perfectly grey cast iron, that is of an iron free from combined carbon is shown in Fig. 1 under a magnification of 50 diameters.* It will be found to consist of a number of dark irregular areas embedded in a light back ground, the former representing the location of the graphite particles, the latter representing the metallic iron. It may at first sight seem surprising that so large an area should be occupied by graphite in view of the fact, that the iron did not probably contain much over 4.00 percent of graphite, but this will be readily explained, if it be considered that this means percentage in weight while the microscope reveals the volume or bulk of the various constituents and because of its relatively low specific gravity the graphite will necessarily occupy a relatively large space.

Iron considered as a microscopical constituent is called "ferrite" and the structure of absolutely grey cast iron may then be described as consisting of a mass of ferrite in which are embedded numerous, irregular particles of graphite.

It will be noticed in Fig. 1, that the etching treatment has resulted in resolving the ferrite into a number of irregular, polyhedric grains, giving to its structure a net work appearance. This net work marks the junction lines between adjacent grains, the etching fluid having corroded the metal more deeply between the grains than over their surface. Most of the grains are hexagonal which strongly suggests that iron, like most metals, crytallizes in the regular cubic system, these hexagonal grains being probably due to interfering cubes and octahedra.

If we now examine the structure of pure iron or at least of carbonless iron as shown in fig. 2, the striking similarity between the structure of this metal and that of the

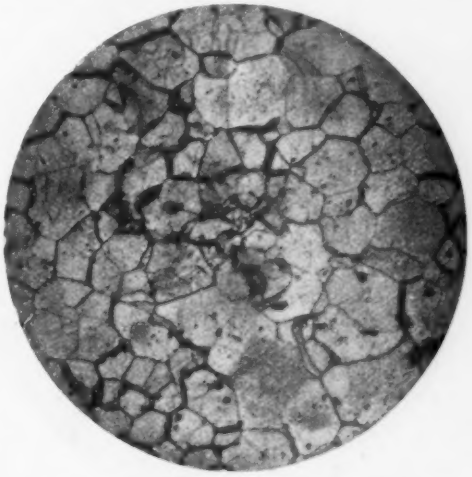


FIG. 2. CARBONLESS IRON MAGNIFIED 50 DIAMETERS.

metallic matrix of grey cast iron free from combined carbon (fig. 1) will be apparent. The ferrite which necessarily forms the totality of carbonless iron exhibits the net work structure seen also in the matrix of the grey cast iron. Both are made up of irregular, polyhedric ferrite grains. There is much structural resemblance, therefore, between perfectly grey cast iron and carbonless iron—and still their properties differ widely. Grey cast iron, free from combined carbon, lacks strength, ductility and malleability while carbonless iron is strong, ductile and malleable. The reason for this difference must be ascribed to the presence of graphite in the grey cast iron which by breaking the continuity of the metallic mass (the strong, malleable ferrite) greatly weakens it and destroys its original ductility and malleability, rather than to the weakness and brittleness of the graphite particles themselves. If all the particles of graphite could be removed bodily, leaving in the iron the small cavities which they once occupied, it does not seem probable that the properties of the cast iron would be materially modified.

It will be apparent from these consider-

*As it was not possible to obtain a piece of grey cast iron absolutely free from combined carbon, we show here, for purpose of illustration, the structure of a salamander, that is, one of those masses of iron and carbon which frequently form in the crucible of blast furnaces, under conditions extremely favorable to the production of graphite and to the exclusion of combined carbon, namely, high silicon content and very slow cooling—such a metal may rightly be considered as an absolutely grey cast iron.

ations that the more numerous the particles of graphite the more will they weaken and otherwise affect the properties of the ferrite in which they are embedded, and it will also be apparent that the shape and dimensions of the graphite particles must also have their influence. If the graphite could be made to occur in small rounded particles

FIG. 4. SALAMANDER (NOT ETCHED) MAGNIFIED 30 DIAMETERS.

it would probably affect the ferrite to a much less extent than when present, as is generally the case, in irregular and curved plates. (See fig. 3.) Indeed this is strikingly borne out by the strength and ductility of malleable cast iron castings in which small, rounded particles of graphite are embedded in a mass of ferrite, similar in every respect to the ferrite of grey cast irons, as will be shown on another occasion.

The foregoing considerations suggest three means of increasing strength of grey cast iron free from combined carbon; (1) by reducing the amount of graphitic carbon, (2) by decreasing the size of the graphite particles and (3) by regulating the shape of the graphite particles, causing them to occur as rounded grains rather than as curved plates.

The amount of graphitic carbon (which here means the amount of total carbon) can be decreased by the use of steel or other low carbon metal in the cupola or by oxidation in the "air furnace".

The sizes of the graphite particles are undoubtedly greatly influenced by the rate of cooling of the castings during solidification and subsequent cooling, and this in turn is affected by the size of the castings. It is probably true that the slower the cooling during solidification and subsequent cooling the larger the graphite particles. In fig. 4 is shown the structure of another salamander formed in the crucible of a blast furnace magnified only 30 diameters. The very large size of the graphite plates caused undoubtedly by the extremely slow solidification and cooling of the iron will be noted.

In the references which have been made here to the rate of cooling it has been supposed that the cooling could in every case be conducted so as to preserve the whole of the carbon in the graphitic condition. As is well known, however, a slight acceleration of the cooling will often suffice even in the presence of a large amount of silicon, to cause the formation of some combined carbon, the iron then ceasing to be perfectly grey and acquiring properties due to the presence of combined carbon which will be considered in our next instalment.

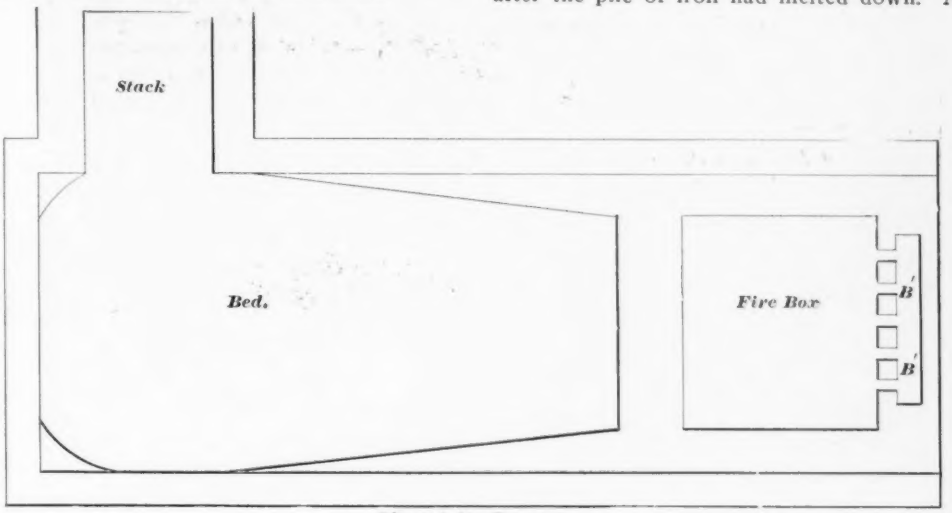
No means have yet been devised for regulating the shape of the graphite particles which form during the solidification and

FIG. 3. HIGHLY GRAPHITIC CAST IRON MAGNIFIED 50 DIAMETERS (NOT ETCHED).

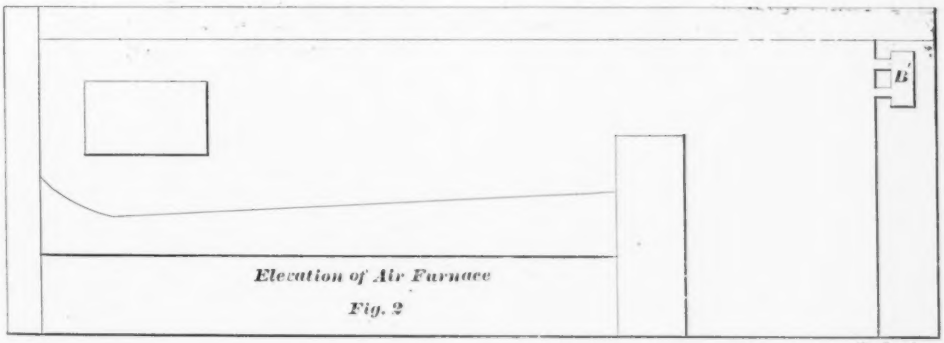
cooling of grey cast iron, but it would be hazardous to affirm that no heat treatment or other manipulation can ever be found which would accomplish this end.

Very few castings if any are produced absolutely free from combined carbon, nor

are they generally wanted because of their lack of strength, but it was desirable to start our description with the structure of such cast iron because it forms the first link of the chain uniting cast iron free from combined carbon with cast iron free from graphitic carbon, the various links of which are to be described in these articles.



Plan of Air Furnace
Fig. 1



Elevation of Air Furnace
Fig. 2

The Foundry.

IMPROVED AIR FURNACES.

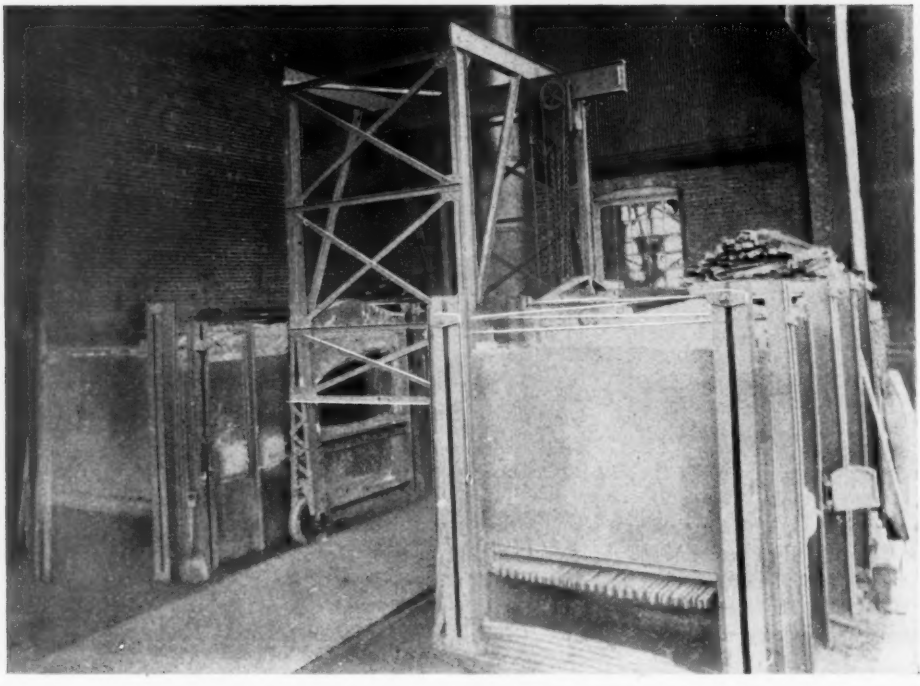
BY N. W. SHED.

In the October issue of *The Foundry* Mr. Blunt makes the point that the increasing area of the air furnace toward the stack facilitates the combustion of the volatile gases, and illustrates the idea by showing the Westinghouse furnace which increases the area by an upward pitch of the roof toward the stack.

There is a certain advantage in this construction for it permits a higher pile of pig iron and scrap at that end of the furnace and also promotes the development of the flame. But the disadvantage of this construction is, that the upward slant of the roof tends to throw a large part of the flame into the chimney flue and thus waste it. This effect would be more noticeable after the pile of iron had melted down. A better construction would be an increase in area of the furnace bed toward the stack, keeping the roof high enough for good combustion but perfectly level for three-fourths the length of the furnace, then slant the roof down to the chimney flue. By having the furnace long enough the flame would do its work inside of the furnace and not in the stack flue.

The straight roof construction is shown in Figs. 1 and 2. A great improvement to any air furnace would be a forced draft. If steam is available a number of steam jets

PITTSBURG TYPE IN FURNACE AT THE BUFFALO FOUNDRY CO., BUFFALO, N. Y.



TWO AIR FURNACES WITH CHARGING CRANE AT LORAIN, OHIO.

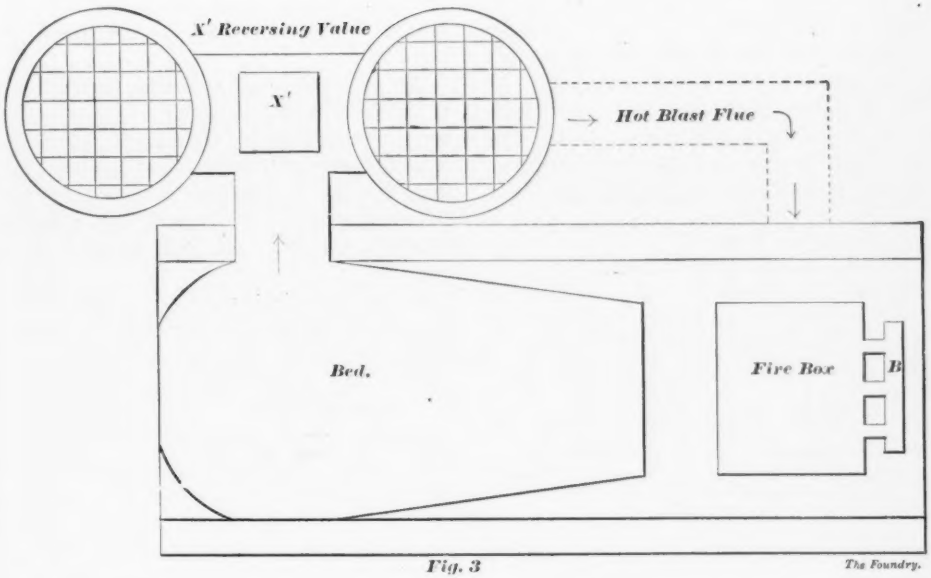


Fig. 3 *The Foundry.*

could be made to inspirate the air under the grate bars just as a gas producer is blown. The steam would be decomposed and a certain amount of hydrogen would benefit the flame.

If steam is not available, an ordinary fan blower would do the work.

But to make the air furnace an efficient melter to compete with the cupola, two things should be done. First, use an air blast and second, heat the air blast.

In the best constructed furnace a large amount of heat is wasted up the stack. If we can use this waste heat to heat the air blast a great economy is assured. This may be done by building two chambers between the furnace and the stack. These chambers to contain firebrick piled cob fashion like the regenerator chambers of the open hearth furnace. One chamber would be heating up by the waste heat of the furnace while the other chamber would be cooling by the air driven through it. At the end of a half hour the valves would be thrown over and the second chamber would heat up and the first chamber would give up its heat to the air blast.

The chambers could be built underground and thus little heat would be lost by radiation.

The same idea could be carried out by building two large stacks side by side and make the stacks regenerative chambers. The stacks need not be over 20 ft. high but the inside diameter should not be less than 5 ft. These could be filled with regenerator brick or if preferred, the hexagon shape flue brick of the hot blast stove could be used.

The flues approaching the stacks would be opened and closed by water cooled valves. The flue at the top of the stack would need no water cooled valve—the ordinary butterfly valve would be sufficient.

A sketch of this construction is shown in Figs. 3 and 4. In actual practice the hot air reversing valve Y would be placed at ground level. By using a portion of the hot blast above the fire a more complete combustion can be maintained and the flame can be made sharp and oxidizing, or smoky and reducing, by opening or closing a valve.

The flue and small ports for admitting hot blast over the fire are shown at B and B'. The two regenerative stacks unite at the top, at the junction is the three way valve to admit the air from the fan and allow the products of combustion to escape. Above this at the top of the stack, a damper is placed which can be shut tight between heats, thus keeping the heat in the regenerators. The improved combustion in this style furnace would bring the heating power of the flame nearer the bridge, and for the same tonnage as the old air furnace, the area of bed and fire box could be reduced one fourth.

An air furnace of this design would cost one-half more than the cost of an ordinary furnace but the saving on fuel would pay the expense in a very short time.

If a furnace like this could be run continuously, the cost of melting would be very near cupola figures and the iron produced would be far superior to cupola metal.

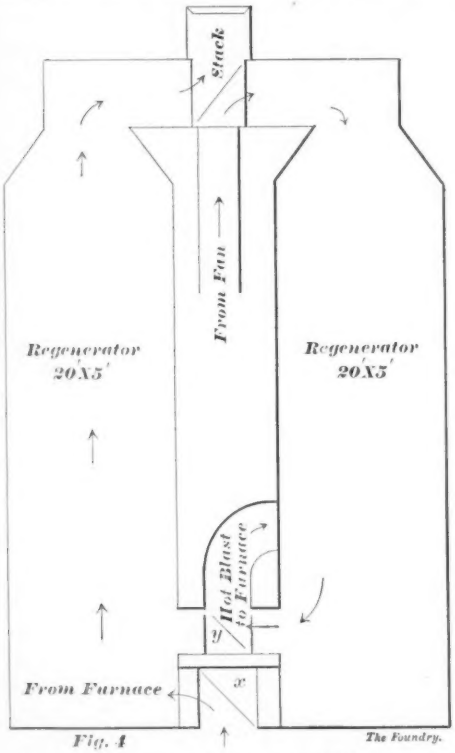


Fig. 4

This furnace would not pay if it were run but once a week as many air furnaces are. But if run every day, or better, two heats every day, it would show a melting ratio very near the cupola record.

FOUNDRY COSTS.*

BY ELLSWORTH M. TAYLOR, BOSTON, MASS.

Costs; the pulse of your business, indicating absolutely the trend of your business vitality.

During the past decade the business methods of manufacturing and producing plants have been entirely revolutionized by the introduction of modern ideas, while the foundry has until recently been practically neglected.

Manufacturers have been brought to realize that they cannot get the full benefit of the introduction of improved mechanical appliances without knowing unmistakably the actual effect these appliances have on the cost of the product.

The old method of estimating selling prices by guessing at the original cost has rapidly been discarded, and facts hitherto allowed to remain in the head or heads of one or two or three employes, as the case may be, have been transferred to positive records, and constitute a tremendously valuable working asset of the business.

A man must die, but the experience of years must live to assist the next generation in bringing the business to the highest state of perfection, without being compelled to travel over the old ground again.

In other words, this is an age of industrial progress and men cannot afford to waste time in solving problems which have once been met and mastered.

The modern business man is practical, if nothing else, and he knows that to conduct his affairs successfully he must have cold hard facts. He measures every step by the dollar rule.

The properly regulated, modern cost system is the relentless eye constantly examining and scrutinizing every nook and corner of your business, calling your attention automatically to leakages and excessive expenditures, substantiating or disproving whatever information may have come to you verbally or by observation, enabling you immediately to use all your energy and brains to cure the sore.

"Why is it," asks the manufacturer, "that we only show a profit this year of 12 percent as against 20 percent one year ago? We have been operating under practically the same conditions and have figured our selling prices in the same way."

There is evidently a serious error in your costs. Your direct labor on certain jobs has greatly exceeded your estimate, the amount of your burden or unseen dollars has exceeded your expectations; your orders have actually happened to run to that class of goods which you are regularly selling at a loss because you have no accurate method showing what your actual burden or unseen dollars amount to, and your method of applying an inaccurate burden to your first cost to establish your selling price is radically wrong.

Your crude method of using your pay roll and material expenditures gives you no proper line on your leakages, your personal observation and verbal reports deceive you as to true

*Paper read at the A. F. A. Convention, New York City, June, 1905.

conditions, and leakages which you should measure in dollars and cents at least once a month, you allow to go undiscovered until the end of a fiscal year, when it is too late.

You are making a gambling proposition out of a legitimate industrial business.

You carry an insurance policy on your life, you protect your property against loss by fire, but you are not carrying a cost policy drawn up on lines which protect the most vital part of your business.

To illustrate how easy it is for the foundry man to fool himself in regard to his costs, one example will suffice.

Some capitalists were considering the advisability of investing one hundred and fifty thousand dollars in cash in an established business including a foundry and machine shop.

The statement had been made that the iron castings were costing at an average not more than one dollar and sixty-seven cents a hundred pounds.

I was delegated to visit the plant and conduct a general investigation. In order to test the accuracy of the foundry costs, I selected a month in which it was claimed the cost was one dollar and seventy-seven cents per hundred pounds.

On examining the cost method I found that several important points had not been taken into consideration. I drew up the data in the proper manner, supplied the missing links, and the actual cost of the castings was found to be two dollars and thirteen cents per one hundred pounds, and not one dollar and seventy-seven cents.

Part of the product of this foundry was sold to the machine shop and figured in the machine shop costs at two dollars per one hundred pounds, and the balance was sold to the trade at an average of about the same amount.

Thus this foundry was actually losing money at the rate of thirteen cents per one hundred pounds instead of gaining twenty-three cents as shown by their cost report.

The existence of this leakage was a great surprise to the officers of the company and they immediately acknowledged the inaccuracy and weakness of their cost method.

Of how much value is this kind of information to the foundry man?

It may mean the very life of his business.

Accurate cost methods are of equal value to the small and large foundry and the general scheme of foundry costs is the same whether you are operating a jobbing foundry or a foundry in connection with a machine shop.

As a matter of fact, the machine shop foundry must be considered in the light of a jobbing foundry. That is, the treasurer of the company agrees to buy the entire output of the foundry for a certain period at certain fixed prices, and the foundry must produce good castings at a cost sufficiently less than the market offers to warrant the treasurer in setting the foundry up in business.

If the foundry cannot do this, it would be to the advantage of the business to close the foundry and buy the castings outside.

And the treasurer cannot afford to fool himself as to the actual conditions.

He will have installed a monthly cost report, divided into three general sections: Metals melted, producing labor, expense.

The monthly postings to these sections will be made up as follows:

Materials.

In every foundry there are certain materials which are purchased from hand to mouth; that is, in quantities which are practically used up from month to month. Materials of this kind are usually miscellaneous supplies, such as molasses, facing, flour, small hardware, etc.

From the cost and accounting standpoint it is best for every foundry to draw up a list of all materials of this nature and as soon as the invoices covering these materials are received and O. K'd, the face value of the invoices should be immediately charged off into the proper subdivision of the expense section of the foundry cost operations for that period.

At the end of each month the accumulated totals of these items will be posted to the monthly cost sheet.

Invoices covering heavy materials, such as the different kinds of metals, coal, coke, sand, lumber, etc., should be charged into a general foundry stores account, and a stock ledger account in card form should be kept of each different kind.

These ledger cards will be debited in the first place with an inventory of the quantity on hand, and thereafter with the quantities as they are received.

A daily melt record must be kept showing in detail and by actual weight the quantities of the different kinds of materials which have passed over the cupola floor.

This daily record must pass promptly to the cost department and the quantities shown must be posted to the credit side of the ledger card covering that particular material.

In the case of all heavy materials which do not pass over the cupola floor, methods must be

provided for daily records of quantities used. Take sand, for example. Pads should be nailed up in a convenient place in the path of the employe whose business it is to transport the sand from the sand bins into the foundry proper. Each time a load of sand is carried in a mark must be made on the pad. The capacity of the wheel-barrow or other conveyance is known and the quantities used may thus be easily obtained.

These records must also be transmitted to the cost department and corresponding entries made on the ledger cards.

The ledger accounts must be closed each month, and the quantities of *metals* used will constitute the gross melt for the month under the "Metals Melted" section of the cost sheet.

The quantities used of all other heavy materials will be carried into the proper subdivision of the *"Expense"* section of the cost sheet.

These card ledger accounts must be periodically checked up with the actual quantities on hand, and thus constitute one check on the accuracy of the daily reports.

In brass foundries particularly the importance of this close check on materials cannot be overestimated.

Labor.

The pay roll must be divided into two general classes, productive and non-productive.

From a cost keeping standpoint, productive labor includes only such labor as is capable of being charged direct to a certain casting or job.

The importance of distinguishing productive labor must be emphasized, because in analyzing your costs the productive hour or the productive dollar is the acknowledged unit of distribution for all foundry expense or burden dollars.

Labor of this kind will be made up principally from the money paid to molders, but in some cases will include helpers and core makers.

Non-productive labor is all labor, including clerical work which for any reason whatever is incapable of being charged to a particular casting or job.

There are in every foundry a certain number of general utility men who are really direct producers, but who spend only two or three minutes consecutively on any particular casting or job.

From a clerical and practical standpoint it is not often feasible to attempt to charge two or three minutes to a certain casting, and for this reason all such work must be classed as non-productive and included in the proper subdivision of the expense section of the cost sheet.

Expense.

In addition to the material and labor distribution to the expense section, there must be charged in each month a fixed sum which is one-twelfth of the total amount of private pay roll, insurance, taxes, interest, depreciation, and all other items incapable of direct distribution.

The cost sheet is then ready for certain final postings which must come from the monthly production sheet described below:

Production.

A daily record must be kept which will give:

First—The gross quantity of salable castings produced.

Second—The gross quantity of foundry tools and temporary equipment produced.

Third—The gross quantity of bad castings returned from machine shop or customers.

Fourth—The gross quantity of bad castings detected in foundry.

Fifth—The gross quantity of gates, sprues, runners, etc., made.

The accumulated totals of these items posted to the proper divisions of the monthly production sheet give the gross pounds which can be accounted for out of the metals melted and the pounds lost in melting.

The totals of items two, three, four and five must then be credited to the cost sheet record of gross melt, and in this way an amount is developed showing the net number of pounds actually used to produce the net quantity of salable castings.

Reducing these weights to dollars and cents and combining with labor and expense data on cost sheet gives you the cost of your product, and your loss or gain.

If the production sheet is properly designed, it will establish beyond doubt the reason for any fluctuation in cost one month as against another.

This method of working the cost down from gross metals melted to net quantities and values is an absolute check against serious error, whether clerical or physical.

For instance, suppose the figures show a greater quantity of salable castings produced than pounds of net material used. Or suppose a loss in melt is developed of more than

7 percent? In the first case, if the error is merely physical, your costs are seriously affected. Or, if you are operating on a piecework basis, you may have paid for more castings than have actually been produced.

In the second case the error may be physical, or there may be serious trouble with your cupola. In either case the subject requires careful consideration and investigation.

A close scrutiny of all the facts set forth on these monthly reports will likewise give the foundryman a line on the actual efficiency and condition of the entire foundry.

Analyzing Costs.

In the large iron foundry comprising green sand, dry sand, loam and machine departments, it is necessary that the daily reports and records provide for a distribution of labor, castings produced and castings lost by departments.

In the jobbing foundry it is important to know the relative value of each customer's business.

To establish these facts it is necessary to accumulate the total number of productive hours or the total productive labor value expended on all work for the customer during a given period.

The cost of the net material used per pound is shown by the monthly cost sheet, as is also the hourly or percentage rate of expense.

These units may be readily converted into total dollar expenditures, giving the entire cost of the product up to your shipping office door.

To know the cost of particular castings or any class of castings the foundry man must have a record of the actual productive labor, in hours or money, expended on the castings. With this fact established the total cost is figured in the same manner as outlined in the previous paragraph.

In brass foundry work the cost of the net material used will vary according to the value of the different mixtures; otherwise, the general method of figuring is the same as outlined above.

Foundry Orders.

The foundry order system should be so designed that the initial entry will by one writing: (1) constitute the permanent office record; (2) advise the pattern shop to prepare the patterns and deliver them to a certain molder; (3) advise the core shop of the number of cores required and to whom to deliver them; (4) authorize the molder to proceed with the work, tell him when delivery is required, and provide him with a place to record the number of good and bad castings which he produces; (5) give complete shipping instructions to the shipper; (6) act as a tracer notifying the office of

(1) The date of delivery of pattern to foundry;

(2) Molder to whom work has been assigned;

(3) Date of final delivery of cores;

(4) Date of completion of order by molder;

(5) Final date of shipment.

The foundry manager is in this way at all times in touch with every order which has been issued, and can answer inquiries with the least possible delay.

A system of this kind is so elastic that it permits each foundry manager to arrange it to cover conditions which may be peculiar to his foundry alone. Furthermore, the order system is closely allied to the method of analyzing costs, and warrants careful thought and attention.

Patterns.

Every foundry manager realizes the importance of a quick handling of patterns.

To facilitate this work all patterns received by the foundry should be catalogued, preferably in card form.

The catalogue should give a complete description of the patterns and the core boxes, stating the number of pieces in each.

The pattern storage loft should be divided into sections, bins and shelves, and numbered or lettered. On the receipt of a pattern it should be assigned to a permanent resting place in the storage loft, and letters or numbers indicating the location should be marked on each part of the pattern. At the same time the location is entered on the catalogue card.

In many foundries today there is an annual leakage of a great many dollars because of the crude and unsystematic manner of handling patterns. Lack of system here places the foundry at the mercy of one or two men who may happen to remember that such and such a pattern was originally stored in a certain section. Shipments are many times delayed and errors are invited, with a consequent feeling of annoyance and irritation reaching from the manager to the shipper.

Again, what will be the loss to the foundry, measured in dollars and cents, if the foundry should be deprived of the services of the man who carries the information in his head?

With the patterns properly marked and cat-

alogued, the pattern storage loft becomes an automatic machine which may be operated by any employe who can read numbers and letters.

Inspection.

Valuable information will be obtained from the proper record of bad castings. It is always to the advantage of the manager to have a positive record of the relative value of his workmen. This information comes primarily from the inspector or from the employe acting in that capacity.

For this purpose "Castings Rejected" slips are issued by the inspector for each casting lost. These slips authorize the workman to reproduce the castings when necessary, act as a notification to the office to deduct the amount from the workman's pay, if the work is piece work, and finally are so treated in the office that a true record of the value of the workman is obtained.

In times of business depression or internal trouble and discontent, these individual records may be effectively used by the management.

The Chemist.

The importance of a periodical chemical analysis of the metals melted and the product obtained is now so thoroughly recognized that it hardly necessary to discuss the subject.

The chemist not only keeps the foundryman from getting into trouble in his mixtures, but reduces the costs by recommending that a greater percentage of scrap may be put into the mixture because the metal people occasionally ship materials of more potent chemical properties than called for in your order.

Statistics.

The cost department should prepare a set of statistics so arranged that the most important points of the cost and production sheets may be compared from month to month in deadly parallel columns.

These statistics should cover the entire fiscal year on one form, and in addition to data of cost, etc., should record ratio of coal and coke to metals melted, average number of producers and non-producers, average number of days worked, and all other data of importance to the management.

Organization.

This subject may be described briefly as the centralization of all work and the authority to do work immediately under the eye of the management.

The management must run the business, or the business will run the management.

General Remarks.

This paper is designed to cover in a general way the vital points which have to do with any and all foundries.

In the actual installation and operation of a system there are always local conditions which require individual treatment and consideration, but the skeleton or framework is identical in almost every case.

THE DETERMINATION OF SULPHUR IN COKE.

BY N. W. SHED.

In the December number of *The Foundry* a comparison of burning methods was given. In one instance alcohol was used for ignition, in the other instance gas was used.

The increase in sulphur due to burning gas can be met by using a gasoline blast lamp which has equal power with gas and no sulphur contamination.

But any method by burning with magnesia and soda is very tedious and chemists have welcomed the sodium peroxide method which has been in use for some time.

The method used for sampling and testing coke at the Foundrymen's Laboratory is this.

Twelve pieces of coke are picked from all over the car. These pieces should differ in appearance. Some should be dense and shiny, some should be dull and porous. Some may be dark colored, some may have bits of shale. Small pieces are broken from these large pieces and pounded in an iron mortar till all passes through a 20 mesh sieve.

The sifted coke is now quartered on a large sheet of paper and the final sample of two ounces is put in an envelope.

About one half ounce of this is ground in a Wedgewood mortar till all passes through a 100 mesh sieve.

The peroxide of sodium, 11½ grams is weighed on a watch glass, or measured in a crucible.

To the peroxide is added .688 gram of the finely pulverized coke. These are intimately mixed on a sheet of note paper and poured into an iron crucible. The crucible is placed on a platinum wire triangle so bent that when placed in a 5-inch evaporat-

ing dish the bottom of the crucible will not touch the dish. Water is poured into the dish till the crucible is half immersed.

The combustion is started by touching the surface of the peroxide mixture with white hot wire or with the point of a blast lamp flame. The action is very lively, a white flame comes out of the crucible and in a few seconds the mixture is fused. After waiting a minute for the fused mass to become perfectly solid, the crucible is tipped over into the water and the platinum wire triangle is removed at the same time. The water acts violently upon the fusion and in a moment all is in solution.

The crucible is now taken out of the solution and rinsed twice with cold water.

The dark, strongly alkaline solution in the evaporating dish is now made slightly acid with 30 c. c. hydrochloric acid concentrated. A small residue of black particles remains in the bottom of the dish. This is filtered off and the clear filtrate in a large beaker is heated to boiling. 20 c. c. of hot barium chloride solution are added. The barium sulphate comes down at once and the solution with the precipitate is boiled twenty minutes. The barium sulphate is then filtered, ignited on the filter and weighed.

The weight in decimals of a gram multiplied by 20 gives the percent of sulphur in the coke.

A nickel crucible is commonly used for this fusion but the action of the peroxide on the nickel is very sharp and the crucible is soon eaten through.

Much better than nickel is a cast iron crucible, 1½ inch inside diameter, 1¾ inch deep and ⅛ inch thick. Such a crucible shows very slight corrosion after months of service.

The method usually takes two hours if the barium sulphate is allowed to settle. If a result is desired in a hurry the determination can be made in one hour.

CORE MACHINE PRACTICE.

Editor *The Foundry*:—In your article in December edition on page 182 we note a Universal Core Machine and notice you say in that article "core machine men claim something for this machine that others claim could not be done." Now I take this to mean core machine manufacturers and, if this is correct, as a manufacturer of core machines, and one of the first to make a successful one, I must take exception to it.

What I have and do claim is that it is impossible to make a core vented end to end and, after being forced through a die, have the ends taper by squeezing, as it closes the hole and leaves no vent in the core, which is the most essential part of a machine made core and the point that has done the most toward making a success of the core machine.

You further say, some makers (core or machine) claim it is impossible to convey sand at right angle to its original course. We cannot understand any one taking this stand, as sand can be conveyed in any position with conveyors and tubes, but the final forming must be done in the last tube. For instance, you cannot form your core in a horizontal tube, then turn it at right angles into a vertical tube, but the sand can be conveyed loose through the horizontal tube and into the vertical tube where it receives its final forming.

We note Mr. Gartside has been at work on his machine about fifteen years but think he has overlooked the two most important points in connection with cores and core machine, that is, the vent hole in the core and the output of a core machine at the present day, and I would suggest, for the benefit of our foundry people in general, to arrange an exhibition, say to be held in Cleveland at the same time as the Foundrymen's Convention in June, a demonstration for all who wish to take part in same, the principal features to be—first, quality; second, quantity; third, expense of production and fourth, cost of mixture that enters into the manufacture of cores, this to decide who has the most successful core machine at the present time.

Hoping you will kindly give this room in your next edition, I remain

Yours respectfully

GEORGE H. WADSWORTH.

Core and Core Machine Expert.

The Iowa Iron Works, Fort Smith, Ark., will erect a plant for the manufacture of ore cars, mining machinery and tools, and also a foundry for making castings of all kinds. The company should be addressed in care of the Commercial Club.

BRASS FOUNDING

THIS DEPARTMENT IS DEVOTED TO THE TREATMENT OF ALL ALLOYS INCLUDING THEIR

FOUNDING, GRINDING, POLISHING, ELECTROPLATING ETC.

PRACTICAL ALLOYING.

V. Foundry Mixtures.

BY JOHN F. BUCHANAN.

In striking contrast to the simplicity and exactness of the formulas specified for standard alloys, the mixtures used in brass foundries generally are variable; the ordinary foundry metals are therefore of unequal properties, and the methods employed in their manufacture are sometimes of doubtful efficacy. Commercialism seems to dominate the brass industry to the prejudice of its products. There is more "monkeying" and fictitious valuation permitted with brass founders' alloys than would be tolerated in any other department of the foundry business. Brass has become a name signifying a metal yellow in color. Gun metal is a convenient term for alloys of more coppery appearance, and in these days when things are being sold, which, (according to the advertisements) "operate to increase the chemical affinity between the different elements of a mixture, and tend to DETERMINE the copper or higher colored elements to the surface," any old metal may be converted into respectable, colorable gun metal. All alloys are the outcome of experiment and research, and as improvements in the manufacture of alloys have had to keep pace with other advances in the metal industries, what time the commercial aspects of the business received attention, many processes having no bearing on the intrinsic merits of the metals, have been adopted in general foundry practice. For example, to avoid the loss due to remelting many excellent gun metals are made by introducing into molten copper, old metals of known proportions, as yellow brass, bell metal, plumbers' solder, etc.

The art of mixing old metals and producing castings of good uniform grades requires a deal of skill, experience and good judgment. So many things may be overlooked in passing a heap of scrap. Some pieces may appear clean and even in the grain, yet the effect of a very small percentage of either antimony, or aluminum in them would be to ruin the whole mixture for many kinds of castings. Every firm has its own methods of manufacture and its own stock-in-trade of mixtures suited for particular classes of work. Every foundry foreman, too, has his favorite mixtures and a note book which he prizes more than a whole technical library.

The need for this note book will be most apparent to those who best understand the delicate and complex nature of certain alloys and the alternative methods of making them. The blending of metals is as much an art as the treating of foods or fabrics, and the "recipes" in the first mentioned business are equally important. The metal-mixer who is called upon to produce alloys to specification, from old metals, must work up a system of averages. For the purposes of the mixtures here shown, yellow brass was reckoned to average copper 2-3, zinc 1-3, bell metal to contain 18 to 20 per cent tin: and the analyses of mixed metals in stock in the foundry where these alloys were made as given in Table I, were sufficient guide to attain satisfactory results as shown in Table II.

TABLE I.

Metal	"Ash" Metal	M. Ingots	H. G. M Railway Axle Bars
Copper	71.60	75.55	82.75
Tin	5.00	1.45	13.04
Zinc	5.42	20.80	3.81
Lead	17.55	2.00	....
Antimony	0.40	....	0.35
Total	99.97	99.80	99.95

Numerous examples might be given of ordinary brass founders' alloys being made from a collection of old metals but a few will suffice to show how much may be done by studying the characteristics and contents of the scrap heap.

Brazing metal may easily be made by adding to melted copper from 1 to 3 times its bulk of brass tubes or sheathing. A

common practice in making cheap gun metals is to melt a quantity of mixed brass scrap and add an equal quantity of standand gun metal. (Copper 9, tin 1.) An excellent antifriction alloy for high speed

TABLE II.

STANDARD ALLOYS FOR MIXED METALS.

Copper.	Tin.	Lead	Y. Brass.	Bell Mtl.	"H. G. M."	Representing Standard.	Castings for
53	—	—	18	28	—	C87 T8 Z5	Merchant Ship.
20	—	—	—	—	100	C88 T10 Z2	H. M. S. "Dido."
84	11	—	4	—	—	C88 T 12	Fire Brigade Hydrant, Edinburgh.
41	—	—	20	32	—	C14 T1 Z1	Trinity Marine Board, London.
1	—	1	—	—	10	C81 T10 L9	Glasgow Corporation Sewage Plant.

Note: all of these metals stood the physical tests required from the specified alloys, notwithstanding deviatoins as great as 1.7 percent form the quantites stated in the specifications.

low pressure machines results from the following mixture, lead shot, 100 parts, antimony 6 to 10 parts. The arsenic in lead shot has a great influence on the antifriction properties of lead-antimony alloys.

Another alloy in which lead shot figures is known as "Ajax" bronze—copper 100 parts, tin 12½ parts, arsenic lead 12½ parts. This is an excellent bearing metal: it is also well suited for cocks and fittings for chemical plants.

The most reliable anti-acid metal is made from copper 3 parts, antimonial-lead 1 part. Good steam metal may be made by simply adding 15 per cent plumbers' fine solder to molten brazing metal. This is a convenient way to use up old flanges. Other examples of mixed metals being used for practical combinations will be found in Table III of foundry mixtures. The quantities are given in round figures, and may be read as pounds, or as parts in ratios suited to the capacity of the crucible or the work to be cast. It is customary in brass foundries to have the "Composition", or alloying metals fixed in relation to the pound of copper, therefore most of the figures are either multiples or fractions of sixteen, the number of ounces in the pound avoirdupois.

The foregoing mixtures were selected from my note books to illustrate the melting practice and mixing methods of good brass houses. My experience extends over twenty-two years, in two hemispheres, and

TABLE III.

SPECIMEN FOUNDRY MIXTURES CONTAINING SCRAP OR OLD METALS.

Copper.	Tin.	Zinc	Lead.	Y. Brass	"Ash Mtl."	"H. G. M."	"M" Ingots.	Cock Mtl	Name.
20	—	—	2½	15	—	—	—	—	Cock Metal.
28	1	—	—	10	—	—	—	7	Red "
16	1	—	2	—	—	—	—	4	" "
16	2	—	1	6	—	—	—	—	Pan "
16	1	—	3	6	—	—	—	—	" "
64	8	—	—	6	—	—	—	—	Screw "
16	—	—	—	8	1	—	—	—	" "
16	1½	—	—	2	—	—	—	—	Bolt "
93	5	2	—	—	—	—	—	0	Steam "
20	2	—	1	10	—	—	—	—	" "
16	1½	—	1	4	—	—	—	—	" "
40	—	—	—	30	—	30	—	—	Gun "
16	2	—	—	2	—	—	—	—	" "
64	15	—	—	1	—	—	—	—	Bell "
64	4	—	1	8	—	—	—	—	Art "
32	3½	—	2	—	—	—	32	—	Bush "
32	5	—	1	5	—	—	—	—	" "
20	3	—	—	14	—	—	—	—	" "
50	—	—	—	—	10 to 30	100	—	—	" "
16	1	—	—	—	1	—	10	—	" "
2	—	—	1	—	4	18	6	4	" "

the figures are taken from actual practice.

Many brass founders run away with the notion that the "mixture" is everything and forget that the melting practice is the most important part in the mixing of metals. Some pride themselves on possessing certain recipes which they imagine give them advantages over their competitors. Experience is the best guide, and careful attention to details the best recipe, for the blending of metals into alloys. Foundry alloys are mostly regulated by the metals available and the prices obtainable for castings. The relative weights of the metals entering into an alloy are of some importance in the final value of the castings.

The addition of aluminum in an alloy is sometimes an economy, just as the addition of lead—the cheapest adulterant, is frequently made a means of gain. The high or low specific gravity of the alloy makes a difference on the price or the profit, nowadays.

TABLE IV.

SPECIMEN FURNACE CHARGES, CONTAINING SCRAP AND OLD METALS.

The figures in this table represent the actual charges in hundred weights.

Castings.	Copper.	"H. G. M."	"M" Ingots.	"Ash Mtl."	Lead	Pan Mtl.	Remarks.
Pumps.	10	50	—	—	—	—	Centrifugal Pumps.
"	4	10	8	—	—	—	Circulating Pumps.
Liners.	10	25	16	2	—	—	Fluid, close grained.
"	5	10	—	10	—	5	
Propeller.	6	24	2	—	—	—	30 lbs. phos copper added.
Tube Plates.	16	4	6	—	—	4	Good red metal.
Brasses.	4	10	—	3	—	—	
Stern Tube.	16	8	16	—	2	—	
Brasses.	1	10	—	—	1	—	Sugar Mill bearings.
Steam Pipes.	3	3	3	9	—	—	Mixed borings, 140 lbs.
Sluice Valves.	22	—	4	22	—	—	Fluxed with 18 lb. old bottles.

TABLE V.

SPECIMEN FOUNDRY ALLOYS, FROM NEW METALS.

Copper.	Tin.	Zinc.	Lead.	Aluminum.	Antimony.	Nickel.	Iron.	Phosphor Copper.	Used for
16	1	1	1	—	—	—	—	—	Cocks, valves, etc.
80	6	8	6	—	—	—	—	—	Marine brasses.
16	2¾	—	¼	—	—	—	—	—	Loco. " "
80	10	10	—	—	—	—	—	—	Propellers.
80	8	4	8	—	—	—	—	—	Mill brasses.
16	1	1	2	—	—	—	—	—	Cock metal.
92	4	1	2	—	—	—	—	1	Pinions.
95	4	—	—	1	—	—	—	—	Hyd. pumps.
82	11	3	2	—	—	—	—	2	Bearings
88	8	—	3	—	—	—	—	1	Slide valves.
88	9	3	—	—	—	—	—	—	Gun metal.
17	—	15	1	—	—	8	—	—	German silver.
28	—	12	1	—	—	9	—	—	" "
45	—	30	—	2	—	—	—	—	Aluminum brass.
4	110	48	—	—	2	—	—	—	Babbitt metal.
2	84	112	—	—	—	—	—	—	" "
57	1	40	—	—	—	—	2	—	Delta "
10	—	80	—	3	—	—	—	—	White brass.
80	8	4	—	—	—	—	—	—	Gun metal.
4	35	—	44	—	17	—	—	—	Navy bronze
—	—	—	—	91	1	—	—	8	Art metal.
140	12	—	—	—	—	—	—	12	Phos. bronze.
55	1	40	—	—	—	1	3	—	Manganese "
100	12	8	—	—	—	—	—	—	Spring metal

Every well managed foundry has a system of collecting and using its own scrap, borings or surplus metals, for the regular grades. Most difficulty is experienced in connection with "foreign" scrap, or metals which have to be judged by appearance or by mechanical tests. Alas! appearances are oftentimes deceitful and even mechanical tests may be misleading as to the blending or alloying properties of a metal which behaves decently if taken by itself. In the examples already given the custom of making alloys from mixed metals is exemplified, but the analyses furnished with these mixed metals made it easy to graduate the components in the finished alloy. This is the exception: the rule in most foundries is to take any old metal that comes along and work it in, (lavishly or sparingly, according to quality) with the metals carried in stock.

THE PREVENTION OF POROUS OR UNSOUND BRASS CASTINGS.

BY H. P. WHITE.

Like all other lines of industry, the brass foundry business has its drawbacks; and among the many prolific causes of direct loss of profit and contingent loss of business to brass founders, porous or unsound castings might be mentioned as the most common and troublesome of all.

I have reference to those castings which have the appearance, on the outside, of being perfect; but when they are machined it develops that they are full of little blow holes of various sizes. Honey combed is the general term used to express this condition, and honey combed castings are, as a rule, worthless for the purpose for which they were intended.

As their true character is never discovered until there has been considerable work done on them, they occasion great loss in the shop; and if they happen to be worked outside of the founder's own shop, they are liable to lead to feelings that will disturb business relations, and cause a loss of patronage to the foundry from which they came.

In many instances brass castings require very little machine work, in such cases the true character of a defective casting may not be discovered until it has been put in service; but the loss is liable to be much

greater under these conditions, as they lead to breakdowns, expensive delays, and sometimes serious accidents.

The blow holes in honey combed castings vary greatly in size, sometimes being so small as to hardly be discernible by the unaided eye. The builders of steam valves can attest this fact, as they sometimes produce valve metal which has the appearance of being first class, and yet leaks steam through its body, when put under pressure.

Many brass founders have been sadly puzzled and almost discouraged by the fact that the same elements, united under apparently the same conditions, would sometimes form a mixture that would produce a fine grade of perfect castings and at other times form a mixture that would produce a worthless lot of honey combed castings, but, notwithstanding this apparent contradictory evidence, it is a fact that like causes will produce like results; and such experiences as those mentioned above are due to variations in the conditions of cause, of a nature which can not be detected by the unaided sense or power of sight.

In order to control a result, it is necessary to have a practical knowledge of its cause. The porous or honey combed condition in brass castings is caused by the presence, in a nascent state, in the molten mixture of an oxide of some of its constituent elements, which reacts in the following manner to produce this result: Sand is a very poor conductor of heat, consequently when molten brass is poured into a sand mold the heat units contained in the metal are forced to the central portion of the casting by the cooling effect of the sand mold on its surface; and if there is any free oxide suspended in the molten mixture the increased temperature tends to deoxidize it, and as the process of deoxidation is always attended by the formation of gases and as the cooled condition of the surface of the casting prevents their escape these gas bubbles remain in the body of the casting creating the fatal porous or honeycombed condition.

Knowing the cause to be the presence of free oxide of metal suspended in the mixture at the time it is poured into the mold, it is easy to control the result, it is only necessary that care be taken to never pour the metal when it is in that condition; but as it is impossible to mix the constituent elements of brass without the formation of oxides to some extent, and as it is impossible to gauge the degree of heat at which each mixture would perfectly neutralize this condition, that is, deoxidize its own nacent oxides, it becomes necessary to add a deoxidizing agent after the metal is removed from the furnace and just before it is poured into the molds.

Several different compounds have been devised to meet this requirement in brass foundry practice, which have proved valuable to some extent; but one of the latest inventions in this line and one that has given general satisfaction for brass and bronze mixtures is Metallic Phosphoro, manufactured by the New Era Mfg. Co., Kalamazoo, Mich.

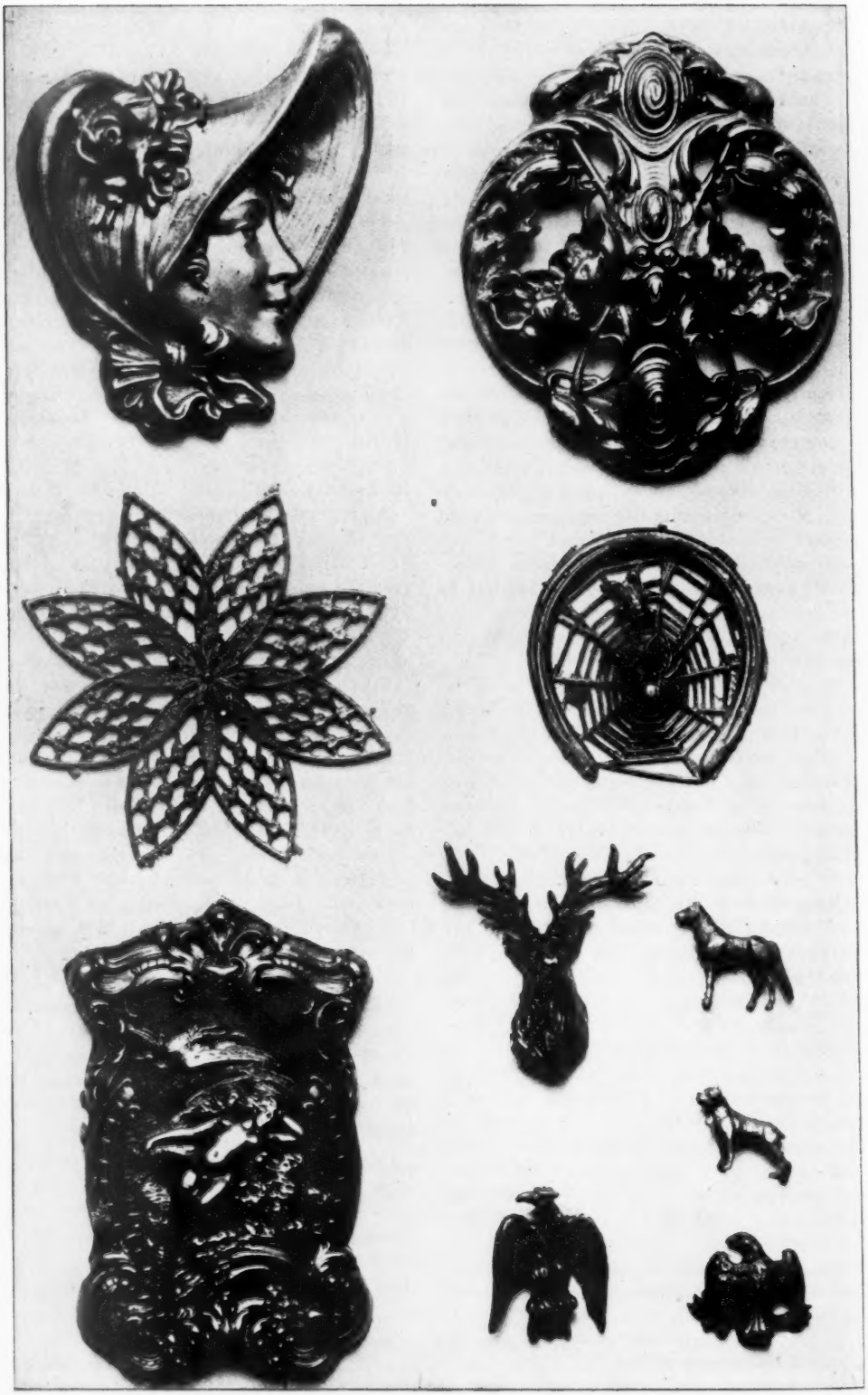
As it is almost impossible to prepare two crucibles of the same mixture under the exact same conditions of heat, it follows that the only safe method is to use an artificial deoxidizing agent; and I recommend Metallic Phosphoro as the most reliable agent of this character on the market.

When it is known that a mixture was subjected to greater heat, in the furnace, than it really required, it is best to add a small amount extra of the deoxidizing agent; but no matter how perfect the condition of heat under which a crucible of metal is prepared, the fact remains that the oxides of some of its elements are suspended in it to some extent; and it is never safe to pour a crucible of brass or bronze without first treating it with a deoxidizing agent.

The Kelly Brass Works, of Chicago, Ill., have recently purchased the property of the Illinois Brass Foundry Co., which is located at 97, 99 and 101 Bunker street, Chicago, and are conducting a general jobbing brass foundry.

John Hoban, of Dayton, O., has started a brass foundry near the plant of the Buckeye Iron & Brass Works. Mr. Hoban was formerly foreman in the brass foundry of the Buckeye Co.

The Northern Indiana Brass Works has been started at Elkhart, Ind., by Casper Schweitzer, who recently sold his interest in a similar business at Coldwater, Mich.

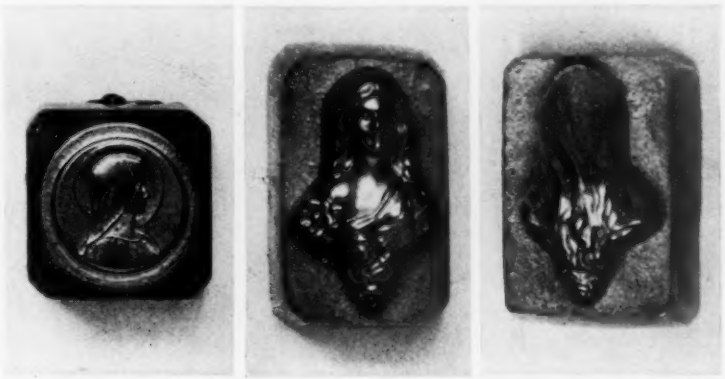


ART CASTINGS PHOTOGRAPHED ACTUAL SIZE. THE FOUR PIECES AT THE TOP OF THE PAGE ARE STERLING SILVER AND THE OTHERS BRONZE.

ART IN CASTING.

Most of those engaged in the various branches of the casting industry have little realization of the extent to which art can be and is carried in some branches of casting work.

All are familiar with the large Bronze statues and similar pieces, but few know how the real art castings, such as silver buckles, brooches, gold stick pins, and similar pieces are produced. Much of the silver work of this class on the market is struck up in dies and there are also many crude pieces which are made from baser metals and plated or washed, but the true art goods can only be produced by very careful painstaking work. The castings shown on the accompanying pages are full sized representations of some of the work of Mr. Joseph G. Weyer, proprietor of the Imperial Casting Rooms, 77 Page street, Providence, R. I. The castings were made in special composition molds according to patent processes, the rights for which are controlled by Mr. Weyer, but all foundrymen who are proud of their craft must certainly feel additional pride when they see such true works of art and a description of the various pieces will undoubtedly be of interest to the readers of *The Foundry*.



HUBS FOR MAKING STEEL DIES PHOTOGRAPHED FULL SIZE. THE TWO AT THE RIGHT ARE FOR MAKING A SILVER HAT PIN.

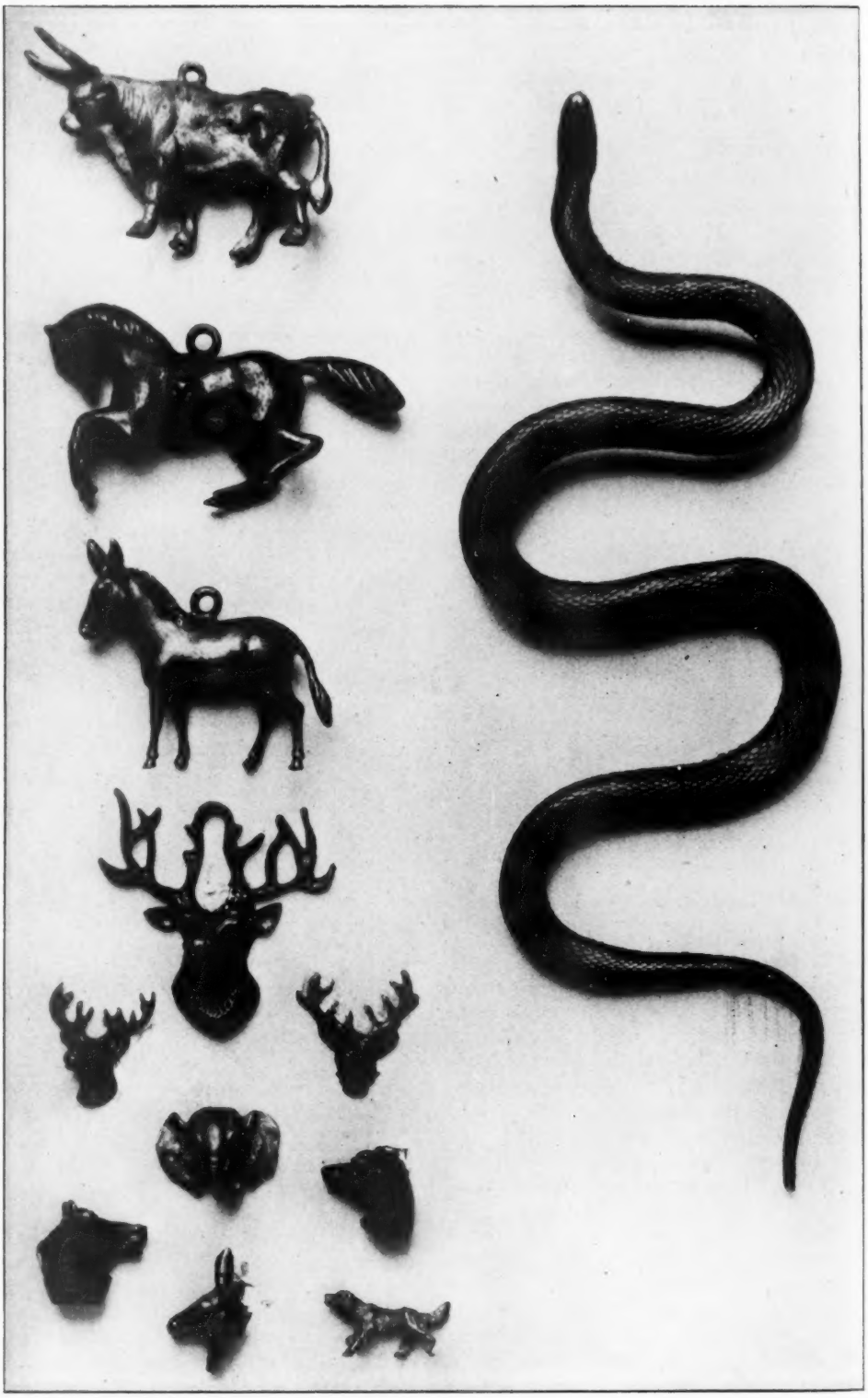
The piece shown in the upper left hand corner of the first page group is a sterling silver casting about 1-50 of an inch in thickness and it certainly shows what thin, accurate work can be made by the process used at the Imperial Casting Rooms. Of course the molds must be dry and warm to run such thin, accurate work and the molds are of such a composition as to leave a perfect finish on the casting. In fact, all of the castings shown are exactly in the condition in which they came from the molds.

In the upper left hand corner of the same page is a sterling silver belt buckle. Large numbers of similar designs are cast each year for the trade demanding genuine and high grade articles in this class of jewelry.

The two castings in the center are in many ways the most remarkable ones in the group. They are sterling silver castings and the manner in which the delicate tracery has been cast sharp in every particular can readily be seen. In both cases the stubs of the gates can be seen still adhering to the outside edges of the castings. The horse shoe was made with several gates around the outside edge, while the star was gated with gates near each one of the points.

The casting shown in the lower left hand corner was made to see how bronze could be cast in a thin, accurate casting. This is a bronze casting made in the same mold intended for making a silver casting for the side of a silver match box.

In the lower right hand corner there is an elk's head and two eagles, also a horse and a dog. These are cast from a special alloy that has been developed for plating purposes and are usually plated with gold before being sold. The bull dog, which is between the horse and the eagle, only



BRONZE CASTINGS PHOTOGRAPHED ACTUAL SIZE. THE SNAKE WAS MADE BY USING A FRESHLY KILLED SNAKE AS A PATTERN.

weighs one pennyweight. In each case the space between the legs of the animals is accurately cored and every leg runs sharp clear to the point.

On the second page of castings the first column is taken up with a group of small animal castings, all of which show remarkably accurate work. The small setter dog is also frequently made in solid 14k gold casting.

The most remarkable piece in the collection is shown on the left of this page of castings. This is a bronze snake cast with the real snake as a pattern. The snake was killed by chloroforming and was then put in the mold. Of course the fresh snake body made a flexible pattern so that it could be drawn from the mold very readily. The parting is a little more than half way down on the sides. The metal has taken the mold so accurately that every scale, the plates of the head and the eyes are perfectly reproduced and will stand careful inspection with the magnifying glass.

Mr. Weyer does not confine his efforts to art casting alone, but has developed several other equally interesting lines.

One of the accompanying illustrations shows a full sized bronze pattern which is used as a master pattern for a carving or engraving machine. These patterns are made directly from the artist's model in wax or any other suitable material. The tracing point of the engraving machine is then passed over the model and the engraving point engraves the same design on the required piece, which may be of metal, ivory, or any other desired substance. The engraving machine is usually arranged on a pantograph principle so as to reduce the figure to a smaller size. In this way the greatest possible accuracy is obtained in the finished carving. These castings can be made of any desired size that the machine requires. Castings 22 inches in diameter have been made and the large castings are just as perfect as the small ones shown.

DIE FOR AN ENGRAVING MACHINE.

In making dies for stamped silver work it is necessary to make what are known as hubs. These are ordinarily carved and chased from steel, which is an exceedingly expensive process. Mr. Weyer has developed a hub metal which is exceedingly hard and which can be forced into hot

steel to form the desired dies. In the accompanying illustrations the front and back portions of the hubs for a hat pin die are shown. Another one of the illustrations also shows the hub for a much flatter form of die. These hubs are molded from the artist's models, the pattern or model being made in wax or any other suitable material which can be modeled cheaply and accurately. In this way the cost of producing dies of this kind is greatly reduced.

BRASS FOUNDRY NOTES.

BY C. VICKERS.

COLOR OF BRASS.

Question.—In making small brass patterns, I cannot get my brass to have a proper yellow color which is what I desire. I use about one-third new metal, (copper, tin and zinc), two-thirds scrap brass and gates from previous heats. I dust my molds with flour and also put the tin and zinc into the crucible after the copper and scrap is melted. Just previous to pouring I add one ounce of aluminum to every 15 lb. of metal. My patterns come out clean and nice but they do not have the yellow look which I desire. Please advise me what I should do.

Answer.—By all means omit the aluminum. Why do you use it? Especially in such comparatively enormous quantities. Any alloy of bronze or brass would be ruined for casting purposes by the addition of only one-sixth the amount of aluminum you use. Your castings must be thin and light, otherwise they would not come out "clean and nice", one ounce of aluminum will alter the color of one hundred pounds of metal, the castings will possess a whitish skin, will shrink in places, where without the aluminum they would not, and will very likely show dross flakes. If you desire a yellow color, use copper 16 lb., zinc 7 lb., lead ½ lb.

MOLDING SAND FOR BRASS WORK.

Question.—Can you tell me what is the best molding sand for general brass foundry practice. Also the best process to employ to produce brass castings with a clean surface—that is, castings from which the sand peels off freely in light, medium and heavy weight castings?

Answer.—I prefer a grade of sand known as Albany, the advertising pages of *The Foundry* will tell where to get it.

It is numbered from 0 to 4. No. 0 is suitable for light castings. No. 2 for heavy, for brass. One grade of sand will not produce the best results, on both heavy and light castings, "heavy" castings being all work over 200 pounds.

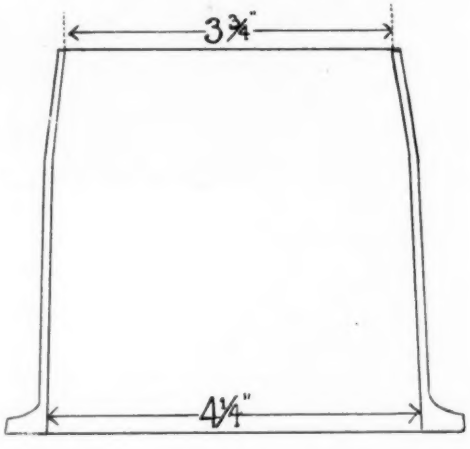
Sand suitable for heavy work makes rough light work, and sand which produces fine light castings causes trouble and increases the cost of molding heavy castings, therefore, if both classes of work are handled use two grades of sand, working the regular brass sand in the tubs, and a coarser grade for the floor.

Do not however, fall into the error of using too coarse a grade of sand on the floor, and avoid clayey sands for brass. And, do not expect to produce clean, bright brass castings in any sand, if dirty, iron-contaminated scrap metals are used.

C. VICKERS.

BRASS FERRULES.

We are making brass ferrules of the general form shown in the accompanying sketch. We are using snap flasks on this work and are experiencing a great deal of trouble in getting them to run. Will you please give us some information concerning this class of work? We use common yellow



brass and have tried different fluxes to make the metal fluid. We also tried pouring on the small end, with a gate inside. We also tried casting on a large end, with three large gates to each casting.

Answer.—This correspondent omits to state whether the castings are cored or not. From the tenor of the communication I judge they were not. It is a mistake to attempt to make ferrules of this size and thickness in green sand. A little reflection will show that where the walls of a mold come so close together, as the 16th of an inch, they abstract the heat from the metal so rapidly, that it chills and becomes solid before it has a chance to fill the mold. So it is a wonder that any of them run at all.

The better way to make this class of work is to core out the inside, and cast them horizontally instead of vertically.

Two or three patterns may be turned on a stick, and one core suffices for all the ferrules on that stick. The castings should be gated individually using thin wedge shaped gates, 1¼ in. wide, which are rammed up in the cope, right on top of each pattern midway of its length.

Supposing there are six ferrules in a flask, we have then six small wedge shaped sprues each leading into its ferrule, to pour into, now if we have these sprues as they are, viz:—flush with the top of flask, and attempt to pour them, we may hit one but the chances are we will spoil the rest by flooding the top of the mold, and getting some of it down the other holes. The result being scrap.

To avoid this, we set six little heads over the six little holes. These heads are made in a core box of core sand. They are simply a ring with a funnel shaped hole, and are small to be economical of sand. We can then pour into each hole without danger of spoiling the other molds. The flask should be clamped instead of weighted.

C VICKERS.

GALVANIZING.

BY DR. R. MOLDENKE.

Considerable attention has recently been called to the coating of iron and steel articles with a layer of zinc, by the new Sheradizing process invented by Mr. Cowper-Cowles, of England. While on the Jury of Awards, in St. Louis, my attention was called to this interesting method of applying a coating of zinc so thin that it will not interfere with the functions of a screw thread on pipe, and yet so penetrating that an article broken in two, will show the zinc an eighth of an inch inwards. As this galvanizing is carried out by simply rolling in zinc dust, at a temperature of 500 degrees F., or below the melting point of zinc, it is a surprise to those who have seen the quality of the product, that it has not been exploited in America as yet.

Like all other improvements, this new galvanizing process will not displace the present one by any means, but will necessarily cause those interested to look more sharply into what they are doing, for the profits to those who keep their fixed charges low is not too great now, and competition will force the makers of "too much dross" out of the business. It is in response to numerous requests from those about to go into the galvanizing business in connection with their regular product, that the subjoined outline of the process as now carried on, is given.

There are two stages in the process The preparation of the castings, pipe, or other iron work; and the actual immersion in the bath of melted zinc. The surface of the iron must necessarily be perfectly clean, so that the crystals of iron may alloy properly with the zinc. This means that all sand, scale, grease, etc. must be removed. Where castings come from the foundry, all superfluous sand must be brushed off, to save acid in the subsequent treatment. Malleable castings, coming from the soft-rolling room, are usually clean enough to go directly into the acid tanks without previous brushing. The material is placed into large vats filled with dilute sulphuric, or hydrofluoric acid for pickling. The latter acid is, however, only used in obstinate cases. Where pipe is galvanized, the vats may be thirty feet long, six wide, and four deep. Steam pipes are provided for so that in cold weather the solutions may be warmed. As a rule, however, the chemical reaction is sufficient to keep the pickle at a good working temperature. The castings are stirred up frequently during the night that they are in pickle, so that gas-pockets are done away with, and the iron comes out perfectly clean all over the surface. The strength of the pickle is regulated according to the time to be allowed for the process. Thirty water to one acid gives

good results, and if the work has time it may be 50 to one. If quick work is desired, 20 to one is necessary. With hydrofluoric acid, the solutions may be weaker than with sulphuric acid. Occasionally it is necessary to take out castings, scratch them vigorously, and put them back into pickle again. This is especially the case where the poorer irons show surfaces on which oxides of iron have united with the sand and make a scale which will yield to almost no acid treatment. After all the use of sulphuric acid is only to loosen up the sand and scale by dissolving away some of the iron underneath. Hydrofluoric acid, however, actually dissolves the sand, and hence should always be around to take care of difficult cases.

If it should happen that castings are greasy, this must be removed with caustic soda before the work is put into the pickle. A further process, which gives the finest results, where it is available, is the sand blast. Castings or other iron materials, when sand-blasted, can be immersed directly into the zinc bath, and galvanize excellently well, though a treatment with hydrochloric acid is preferable before immersion, so that no chances are taken.

After the castings are ready, the acid is drawn off, or else the castings are removed, and a thorough washing is given them to remove the acid. Preferably the washing is given in the same tank, warm water being used. This allows a washing out of the tank to remove the scale and sand. The work could now go to the drying oven preparatory to the galvanizing process, but the best practice introduces another short pickle with heavily diluted hydrochloric acid. As soon as it is seen that the work is again attacked, it is taken out and put into the drying oven without washing. This not only dries the castings and gets them very hot before they go into the zinc bath, but it leaves a coat of chloride of iron, which when volatilized by the heat of the galvanizing tank, leaves a very clean and rough surface to be coated.

The drying ovens are simple chambers heated up with coke fires. They have big doors in front, so that the work may be quickly put in and taken out. They are usually close to the tanks of melted zinc.

The bath of zinc is simply a large tank furnace, preferably made of very heavy structural steel, and may be 20 feet long, 4 feet wide and 4 feet deep. To last as long as possible, the thickness of the plate and angles may be ¾ inch for the wear on it is terrific. Outside coke fires all along its length. Inside overheated fluid zinc, which is kept in that state months at a time. The older tanks are made of cast iron, but if a crack develops, it means much loss.

In immersing the castings or pipe, etc. the greatest care must be taken to keep away from flying metal, in case the material does not enter dry. If a pipe is damp inside, and is put in endwise, an explosion as from a gun results, and woe is him who stands at the other end. Castings which are small are wired together, or dropped in while held by wire baskets. Sal-ammoniac is thrown on the surface of the bath to keep it clean, and to promote the alloying action. The addition of some pure aluminum is also good, as it deoxidizes the bath slightly and gives a better appearance to the finished material. Large castings are handled by block and tackle, or a traveling hand crane. A trowel is used to take off surplus zinc after the castings have been allowed to drip off what will go naturally.

From the galvanizing tank, castings may be either dropped into water tanks by swinging around the baskets in which they are dipped, or else a conveyor may do this automatically. The castings can be inspected at this time, and defective work returned. Occasionally grease is thrown on the galvanizing bath, as this also protects the surface from oxidation, and helps the alloying. From the water, the galvanized articles may either be left to dry, or go to sawdust boxes to lose their moisture quickly.

One of the worst features of the galvanizing process is the accumulation of the so-called "dross". This is an alloying of the impurities introduced into the tank, and also a partial oxidation. Thus, some of the iron of the castings will stay in the bath, alloying with zinc, and as this can hold only a small percentage in solution, an excess means the formation of material which drops to the bottom. Unless removed periodically, this means the ruin of the tank. Large scoops are therefore

pushed down into the bottom layers, the dross lifted out, entrained liquid zinc runs off, and the dross is dumped into molds, to be turned over when cool enough, and the cakes of dross are ready for treatment.

Unfortunately, the quantity of dross made by a live galvanizing works, may amount to a quarter of the zinc bought, and this proves a serious item, as the zinc companies do not pay good prices for the material, and only give new spelter in exchange. Small furnaces are therefore to be found in all galvanizing houses, these furnaces having inclined hearths. A fire is built under the hearth, the fumes of the decomposing fat escape up the chimney, or get into the room, with consequent cessation of work by every body, and liquid zinc runs down and is caught. This is limited in quantity, but pays for the treatment.

The accumulation of dross on the bottom always means the burning and blistering of the plates, with great damage to the tank. Oftentimes, at the end of a week's run, when the dross is usually removed, it may amount to one quarter of the bath. Hence where there is time, the removal of the dross should be attended to more frequently.

The skimmings of the zinc should also be preserved, and sold to the refiners, as they contain much of the metal. Where close attention is paid to the buying end, so that the purchases are made during the dull times of the trade, enough money can be made to off-set many of the losses which are unavoidable. On the whole, the process is one easily learned, and requires but little equipment, and hence one often sees a family put in a small tank, and run a little business on almost no capital. Where the above method is followed, surfaces which show fine effects, and well galvanized articles are obtained.

A SMALL MELTING RATIO.

We noticed an article in the paper entitled "A Small Melting Ratio", by C. T. Strots. We wish that Mr. Strots would tell us,—first, the number of rows of tuyeres and the number of tuyeres to the row; second, the size of the tuyeres; third, the height of the first row from the bottom; fourth, the distance between the first and second rows of tuyeres if more than one row was used; fifth, the number of tons of iron melted per hour; sixth, the blast pressure. U. E. & F.

TRADE PUBLICATIONS.

The B. F. Sturtevant Co., of Boston, Mass., has adopted a new system for the presentation of their trade publications. In place of sending out individual catalogues a series entitled the "Sturtevant Engineering Series" will be sent out. Each bulletin of this series will treat of some particular product or its application. The series will also include reprints of articles or technical papers which have a bearing upon the products manufactured by the company. All publications will be issued in uniform style and of size suitable for combining consecutively or in allied groups. In this way the Sturtevant literature will be kept up-to-date and the company will be able to present new designs or typical appliances in a form which will be of the greatest service to those interested. Bulletin No. 125, the first of the series, has just been published. It describes in detail the line of automatic vertical engines manufactured by the B. F. Sturtevant Co. These engines vary in size from 5 x 5 inches to 12 x 10 inches. They are entirely enclosed and all bearings lubricated by a pressure oil system under a pressure of 15 pounds. The engines were designed to meet the exacting conditions of dynamo driving and are capable of continuous operation through long periods of time without skilled attendance.

The Corrugated Concrete Pile Co., of New York City, is sending out a publication describing its product. It is in the form of a catalogue 2¾ x 10¾ inches. The piles are thoroughly illustrated, including their manufacture and use and the publication contains many points of interest to users of this class of material, but we presume that the majority of these catalogues will go where the editor put his, that is, in the waste basket, on account of the fact that the odd shape makes it practically impossible to file it in any ordinary catalogue file. There are standard sizes for catalogues. Why not use them?

METALS IN FOUNDRY PRACTICE

Devoted to inquiries from Practical Foundrymen on subjects relating to the Melting and Using of Cast Iron, Malleable Iron and Steel.

The following experts answer questions in this department:

W. J. Keep, Cast Iron.

J. B. Nau, Metallurgy of Steel and Steel Castings.

Dr. Richard Moldenke, Malleable Castings.

We have also made arrangements with several others to act as special contributors. All inquiries should be addressed to the Editor of THE FOUNDRY, and they will then be forwarded to those in charge of the different subjects.

CAST IRON NOTES.

BY W. J. KEEP.

NEWLY LINED CUPOLA.

Question.—Why does not a newly lined cupola melt as hot as before lining?

Answer.—Simply because the lining was not as dry and the cupola was not as hot. It takes about two hours to heat a cupola whether a small or a large heat is to be made. The same care is hardly ever taken with an irregular heat during a shut down as when running regularly and consequently the iron is not so hot.

ACCURATE TEST RECORDS.

Question.—I notice that the distance between the chilling surfaces of your yokes is not exactly one foot. Is this correct?

Answer.—Great care is taken that the chilling surfaces are perfectly true and parallel but no care is taken to make the distance exactly 12⅛ in. They are more often nearer 12 in. The shrinkage record is comparative day by day. I have taken every precaution in flasks, followboard and patterns to insure true testbars and correct records of shrinkage and yet you would be surprised at how few molders make correct testbars. I say never wrap the pattern in the mold and to oil the surface of the chilling yoke before and after using to prevent rusting of the surfaces.

But the surfaces are rarely examined and in most cases are coated with rust and the surfaces are often irregular. These surfaces should be kept perfectly true with a smooth file or on the flat side of an emery wheel and always oiled.

There is no need of ordering new yokes. The distance apart of the surfaces is of no consequence. The rule is to measure the shrinkage of the test bar in the yoke and in the exact position that the pattern and yoke lay on the followboard. Inaccuracy in molding testbars is very common. I have known of a seemingly intelligent founder molding 1-in. square test bars in open sand and testing bars ⅛ in. too large and he did not think such slight differences would affect a test record of 2,500 lb. A chemist is absolutely accurate in weights. If a founder uses the shrinkage test, he should be equally accurate because both regulate the mixture in the same way by a corresponding variation of silicon.

BURNT IRON.

Question.—Can iron be melted so hot that it can be burned in a cupola or can iron be burned in any other way in a cupola?

Answer.—The reply is *no.* The heat of a cupola is never so great as the heat of the blast furnace in which the pig iron was made. The hotter the cupola the faster the iron will melt. The instant that the heat is sufficient the iron on the surface of the pig melts and drops away and falls quickly through the air that is entering the tuyeres and into the bed of incandescent coke below the tuyeres. This coke is kept hot by the melted iron that falls among it. The hottest part of the cupola is where the iron melts and there it is just hot enough to melt the iron but never hot enough to burn it. Iron cannot be burned by a short contact with a melting flame or by a momentary contact with hot fuel. To burn iron a casting must be exposed continuously to hot fuel on one side and to the atmosphere on the other.

Iron kept at a red heat continuously will absorb sulphur and will become oxidized in the interior of the casting. This is called burnt iron, but cast iron coming rapidly into a melting heat will melt and run away from the heat and from the air and cannot burn.

HIGH MELTING RATIO.

Question.—From a record of your cupolas which you gave me I see that you average for your three cupolas a ratio of 9 to 1. How do you do it? I cannot do better than six to one and if I take off any coke I get dull iron.

Answer.—I have been in the same condition. Our cupolas are not constructed correctly for high economy. We charge all

gates and sprues with the sand on; we do not even remove the sand from the iron from the pig bed, but outside of this we are careful to charge evenly and to break all scrap quite small and not to throw any loose dirt from the scaffold into the cupola. We use a rather high wind pressure, say about 14 ounces, and we slag our cupola as soon as there is enough slag to run.

Our correspondent asks when it is best to slag a cupola? It is best to keep the liquid slag below the tuyeres and when you melt off the sand from scrap as we do you must get it out of the cupola.

If you choose to mill your scrap and sprues and run small heats you need not tap slag, in fact you might not find any.

In such case you ought to melt more economically than we do. There are several ways to figure the melting ratio. The correct way is to divide all the iron that goes into the cupola by all of the coke that is weighed into the cupola in any one day, including the bed. The coke sand out of the bottom should not be weighed back but given to the melter to do with it as he chooses. There is about the same amount saved each day. The iron picked out of the bottom is weighed into the cupola each day as remelt. You cannot weigh the coke picked from the bottom because it is water soaked and is full of iron and partly burned and therefore very heavy.

METALLURGICAL NOTES.

BY L. G. BLUNT.

AIR FURNACE IRON.

One of your readers wishes to know how the writer raised the silicon content of the heat from which the test piece shown in Figure 2 of the article on the "Air Furnace" in the December number of *The Foundry* was taken. This was done by adding 25 percent silicon alloy.

VALUE OF A TRADE.

Professor John E. Sweet, in estimating the value of a trade to a young man, thinks that the man who has just acquired the trade has something that is equal at least to $6,000 in cash, which will yield at five percent an annual income of $300. Then too, he might lose the money, but he cannot lose the trade.

ASSOCIATIONS AND SOCIETIES.

New England Foundrymen's Association.

Fred F. Stockwell, Secretary, care of the Barbour-Stockwell Co., Cambridgeport, Mass.

The regular monthly meeting of the New England Foundrymen's Association was held at the Exchange Club, Boston, Wednesday, Dec. 13. Dinner was served at 6:00 o'clock after which the routine business was disposed of in the usual manner. President John Magee presiding. Nominations for officers then being in order, President John Magee declined to serve again, and the following were nominated to be balloted upon at the annual meeting. President, Walter B. Snow, of the B. F. Sturtevant Co.; vice president, Wm. H. Bense, Kinsley Iron & Machine Co.; secretary, Fred F. Stockwell, Barbour-Stockwell Co.; treasurer, Geo. H. Lincoln, of Geo. H. Lincoln & Co.

For an executive committee of five the following were nominated: Henry F. Arnold, American Tool & Machine Co.; Henry A. Carpenter, A. Carpenter & Sons Foundry Co.; Chas. J. Caley, Russell & Erwin Mfg., Co.; Arthur Gibby, Mechanics Iron Foundry; A. J. Miller, Whitehead Bros.; Henry Souther, Souther Engineering Co.; H. E. Wetherbee, Jas. Hunter Machine Co.

Arrangements for the January meeting were left in the hands of a committee consisting of the present and past presidents of the Association, Mr. H. A. Carpenter acting as chairman. As this will be the annual meeting and tenth anniversary there will be many special features and it is hoped that there will be as large an attendance as possible.

The president then introduced as speaker of the evening Dr. Richard Moldenke, of Watchung, N. J., secretary of the American Foundrymen's Association, who read a very interesting paper on "Tendencies in the Foundry Industry." (This paper will be published in *The Foundry* at a later date.) After a brief discussion of the paper, a vote of thanks was tendered the speaker and the meeting adjourned.

Philadelphia Foundrymen's Association.

Howard Evans, Secretary, care J. W. Paxson Co.

The one-hundred and fifty-second meeting of the Philadelphia Foundrymen's Asso-

ciation was held at the Manufacturers' Club Wednesday evening, December 6, president Devlin presiding. There were about forty members and visitors in attendance. The report of the treasurer was read, showing a balance of $1,950.17 in the treasury, and all bills paid.

President Devlin announced that Mr. George C. Davis, the official chemist of the association, had prepared a card of directions, for sampling pig iron and would be glad to mail a copy to any one applying to him.*

With the exception of Mr. Thos. B. Harkins, who resigned as a member of the executive committee, the same officers were nominated and re-elected for the ensuing year. Mr. George C. Davis was elected to fill the vacancy on the executive committee created by Mr. Harkins' resignation. The list of officers at present is as follows: President, Thomas Devlin; vice president, Alex. E. Outerbridge Jr.; treasurer, Josiah Thompson; secretary, Howard Evans; executive committee: H. O. Evans, Thomas M. Eynon, E. E. Brown, R. C. Oliphant, and George C. Davis. Trustees, Thomas Devlin, Josiah Thompson, Howard Evans. Official chemist, George C. Davis.

The secretary announced that the next annual meeting would be held on the first Wednesday in January.

The speakers of the evening were Samuel McCune Lindsay, Ph. D., Secretary of the National Child Labor Committee, of New Jersey, and A. J. McKelway, D. D., Assistant Secretary of the National Child Labor Committee, of Charlotte, N. C. These gentlemen addressed the meeting on the subject of child labor and all present were very much interested in the subject and especially in the able way in which it was presented. The speakers told of the present laws and the effect which they were having and also called attention to the necessity of future legislation, and especially to the necessity for co-operation on the part of manufacturers if the workmen of the future were to be up to the standard required in this country.

*This card is reproduced in an article elsewhere in this number of *The Foundry*. There was considerable discussion of the subject and a vote of thanks was tendered to the speakers. It is probable that few of the members present knew of the laws on the subject before the meeting.

Pittsburg Foundrymen's Association.

F. H. Zimmers, Secretary, care Union Foundry and Machine Co., West Carson Street

The December monthly meeting of the Pittsburg Foundrymen's Association was a departure from the ordinary inasmuch as no papers were read or discussed. Instead the members, to the number of nearly 100, held a banquet at Hotel Henry and after the introduction of Prof. C. B. Connelley of Carnegie Technical School, the association adjourned to the Technical School, which was thrown open for their inspection and the evening was profitably spent in examination of the facilities of the institution toward giving its students a technical education. Under the guidance of Director Arthur Hamerschlag and Prof. Connelley the members were conducted through the entire institution so far as it is completed and the aims and objects of the school were gone into in detail for the benefit of those present.

There are now 366 students regularly enrolled in the School of Apprentices and Journeymen and of those 120 are in the day classes, 144 in the regular night classes, 144 in the special night classes and 58 in the architectural department. Only seven buildings of the whole, which when completed will occupy 32 acres of ground, have been completed and members of the association were shown through the machine shop, pattern shop, forging shop, foundry, engine room, chemical laboratory, department of mechanical drawing and architectural departments and concluded by listening to an address by Director Hamerschlag, who asked the foundrymen, as an association which has hitherto worked among its members alone, to take up the subject of the technical school, hold their meetings in the auditorium and allow the students, who are interested in all practical matters of interest to the foundrymen from a practical standpoint, to listen to the papers read and discussed. He asked the foundrymen to advise their men to attend the school, said that a new era was dawning and that five years from now the students of the school would have the theory as well as the practice and would be the men to solve successfully the problem of output, quality and rate of production which are now confronting the foundrymen. He said the institution needed applicants

for courses in pattern making and journeymen molders as well as for the course in shop mathematics, that these men would get the benefit of a foundry course in practice, side by side with the engineering courses as well as the metallurgical and laboratory departments. Speaking of the benefits of these courses of instruction he said force against force never accomplished anything but that education properly applied brought results. A majority of the students, he said, worked during the day, got their practical experience in the shops and foundries and attended the schools at night and obtained their theory, and that this combination gave them the essential qualifications to make good in what they undertook.

On a motion by President B. D. Fuller, of the Pittsburg Foundrymen's Association, Director Hamerschlag, the school and faculty was given a rising vote of thanks for their hospitality.

Newark Foundrymen's Association.

H. L. Gebhard, Secretary, 36 Francis St.

The Newark Foundrymen's Association held their monthly meeting on Thursday evening, December 7. The meeting was held at "Achtel-Stetters's" and dinner was served at 6.30 P. M. The members present witnessed one of the largest gatherings of foundrymen since the association has been organized.

Nearly every firm in the city was represented. After the dinner the president, Mr. D. M. Meeker delivered a short address, then introduced Prof. Bradley Stoughton of the School of Mines, of Columbia University.

Prof. Stoughton talked on the subject of "Foundry Mixtures," and illustrated his remarks by lantern slides, which were thrown on a screen also passing around several samples of iron and steel, showing the good and bad qualities.

The talk brought out considerable general discussion, during which many questions were asked and answered by Prof. Stoughton and his assistant, Mr. Thompson.

This ended a very interesting as well as profitable evening and after a vote of thanks was extended Prof. Stoughton and Mr. Thompson the bottom was dropped and everybody decided that no bad castings were obtained during this heat.

Philadelphia Foundry Foremen.

W. P. Cunningham, American Bridge Co., Secretary.

Mr. Cunningham writes as follows concerning the last meeting of the Philadelphia Foundry Foremen: "It gives me much pleasure to inform you of the interesting meeting held this P. M., December 11. One reason for our good meeting is the large attendance; also the good papers read by well known men in the foundry business. We had the pleasure of having Mr. Frank C. Everitt of the National Association with us. He told us how one of the local associations had taken up the assisting of apprentices by arranging to instruct them in drawing, arithmetic and other subjects of use in the foundry business. We are having new additions to our membership each meeting."

Erie Foundry Foremen.

W. F. Grunau, Dist. Vice Pres., care Erie City Iron Works.

The Erie Foundry Foremen held a well attended meeting on Monday evening, Dec. 4. Harry Bury read a very interesting paper on Cylinder Work. The members have been showing a great deal of interest in the papers which are read before the Association.

Chicago Foundry Foremen.

Mr. Thompson, Link Belt Co., District Vice President

The regular meeting of the Chicago Foundry Foremen was held on Saturday evening, Dec. 16. Mr. Vroman was present and read a very interesting paper on molding sand which is published in this issue of *The Foundry*. Mr. Vroman had several samples of sand with him and demonstrated the manner in which they could be blended to change the character as the work might require.

After the reading of the paper new officers were elected as follows: C. J. Wiltshire, of the Western Electric Co., president; David Spence, of Greenlee Bros., vice president; Eugene Smith, of the Crane Co., secretary and treasurer; John Brady, of the Jones Foundry Co., sergeant at arms. Nine new members were elected to membership.

BUFFALO FOUNDRYMEN'S ASSOCIATION

John E. Gross, Secretary, 23 Builders' Exchange.

THE ASSOCIATED FOUNDRY FOREMEN.
Frank C. Everitt, care the J. L. Mott Iron Works, Trenton, N. J., Secretar

NEW YORK FOUNDRY FOREMEN'S ASSOCIATION.
C. H. Thomas, 14 Elizabeth St., South Norwalk, Conn.' District Vice President.

CLEVELAND FOUNDRY FOREMEN.
W. H. Nicholls, 608 Gordon Avenue, Secretary and Treasurer.

INDIANAPOLIS FOUNDRY FOREMEN.
W. S. Keller, of Hetherington & Berner Co., District Vice President.

CINCINNATI FOUNDRY FOREMEN.
E. W. Cadwell, Secretary, care S. C. Tatum Co.

HAMILTON, ONT., FOUNDRY FOREMEN'S ASSOCIATION.
A. Chase, care Sawyer & Massey Co., Secretary and Treasurer.

MILWAUKEE FOUNDRY FOREMEN.
Sol. Shaw, care Clinton Street Foundry of Allis-Chalmers Co., Secretary.

THE FOUNDRY NO PLACE FOR GIRLS.

Mr. Editor:—

There is one practice that is getting to be entirely too common in some parts of the country. It is one that every good citizen should do all he can to discourage for I do not think that the final outcome of the matter will be anything but evil in its effect on the nation.

I refer to the working of girls and the term girls includes females just in their teens at one end and grey haired women on the other in the foundry.

It is confined to working them in the core room at present, at least as far as my observation goes, but work they are doing there is just as hard and takes as much skill as would light bench moulding, and it is just one step further until some man or firm, greedy for the last cent that can be squeezed from the business puts them at that, and the next thing will be to find them all over the foundry.

My opposition does not come from a general desire to shut women out from work where they may happen to compete with men, but it comes from a belief that such work as is found in and around a foundry is not suitable work for any woman. The work is dirty, so dirty that it is impossible for anyone engaged in it to keep clean, and it is hard for any one to have the same degree of self esteem with old dirty clothes on, and hands and face begrimmed that they have when they are clean and tidy. It is harder yet to have and keep the esteem of others under such conditions.

This is not a matter of fancy or of sentimentalism; it is a matter of fact. Go to any community you will and you will find that the average moulder does not occupy the same place socially in the community that the clerk who is earning much less wages, does. If this be true of men think what it must mean for girls to keep their standing.

It will not do to dismiss this matter with the statement that it is only a class of foreign born girls who are used to rough surroundings who will be found at such work, neither will it do to deny the lowering of the moral atmosphere.

While the most of the girls at present engaged in such work may be of foreign birth, many are not, and even if they all were it would not then be good for the community to have them so employed.

It does not take any extended experience around a foundry to find out that the general tone is not one of refinement, and I do not think that there is a decent man in the land who has a real knowledge of it who would willingly have his own sister or daughter earn her living in it.

The home is the center of the universe to the individual. For its protection we have government To make it possible men go out and build up business. It is the foundation on which is built the moral, religious, national, and industrial life of the world.

The center of the home is the woman: Your mother, boys, and mine in the beginning: Your wife, men, and mine in the noonday of life: Your daughter, father, and mine in the evening.

I am not a preacher and this is not preaching. My business is to get out castings, and to get them out good and cheap, and I am trying to do it.

I can listen to the vocabulary of the ordinary, or even extra-ordinary moulder without having a moral convulsion, or feeling my hair curl, but I cannot stand by and see a lot of girls clad in old shoes which only partly protect the feet, gowns which may keep the sand and dirt out but which do little more, arms bare and covered with core wash, and face and neck streaked with various mixtures, hair in a tumbled condition and hands too filthy to touch it, and after noting these

things and the expressions on the faces, think that it pays to have it so.

A cent may look awful big to some people, but there are prices that it will not do to pay for even the biggest kind of a cent.

It is not wise to save at the spigot and waste at the bung hole even if the waste is from a general fund and you are only one of the many who have to supply it.

I was one of a number of people (several hundred) who recently visited one of the largest industrial establishments of this country, and the only really unfavorable criticism I heard in regard to what was seen was on this very point. This I heard mentioned on all sides, and without one favorable word being said about it. It is one practice that should be discouraged by all.

I believe in the nobility of labor, but there is work which you cannot imagine a manly man as being engaged in, and so there is work that you cannot imagine a womanly woman as being engaged in.

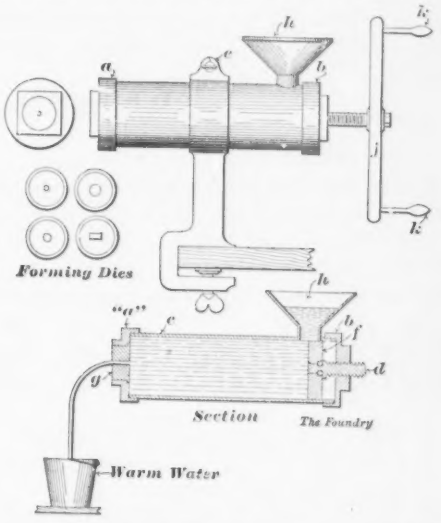
There may be some differences of opinion in this matter, but it should at least receive the same careful attention as methods of foundry accounting, the ways of moulding difficult work, the use of moulding machines, the wash mixtures &c., and when it does I think it will be settled in the right way.

A SHOP MAN.

A WAX VENT MACHINE.

BY VANCE ADAMS.

I include herewith a drawing of a machine for making wax tapers or wires for forming vents in complicated cores. I have tried it on all classes of cores, including our three and four-ton cylinders and jacket cores. Since using these wax vent wires we have never been bothered by the cores blowing or giving any trouble. I use paraffin which costs five cents a pound, and two pounds will make 35 ft. of ¼-in. taper. The paraffin is put in warm water until it can be made in a ball with the hands, and it is then put into the machine through the feed holder H. When the machine body C is full of paraffin the hand wheel J is turned by the handles K K, thus forcing the piston F forward and pressing the wax out through the hole in the die block G. The dies G can be changed by taking off the cap A so that any size or shape of vent wires may be made. The tapers are coiled up so that they can be hung up until wanted. When they are to be used the coil is put into a bucket of



warm water to soften it, when the tapers can be bent into any desired shape. The writer will be glad to send a sample of the wax to any brother who wishes to try it.

FLUOR SPAR AS A FLUX.

The writer has for some time been interested in the discussions which have appeared in *The Foundry* regarding cupola work. Some years ago a large pipe casting concern had a great deal of trouble with castings (pipe) breaking after casting. Several foremen were discharged on this account, and the difficulty was not remedied until a small quantity of fluor spar was used in the charge. This seemed to increase the tensile strength of the castings, and also gave a smoother, cleaner casting than they had previously been able to obtain. The breakage also ceased from the time the fluor spar was introduced.

The writer knows that the experiences of this firm has lead other concerns producing the same class of castings to adopt fluor spar as a flux. While the writer possesses no positive knowledge on the subject, it seems that a small quantity of fluor spar caused the molten metal to be more liquid so that the impurities of all kinds which are lighter than iron will rise to the surface and slag off.

The object in writing this letter is to obtain expressions from some of the practical cupola men as to why it would not be

advisable to use a few pounds of fluor spar in each charge, and obtain good results as above stated. If the charge becomes sluggish or pasty, fluor spar is always a handy remedy.

F. S. GRINDER.

SAMPLING PIG IRON.

There has been much discussion as to the best method of sampling pig iron. To avoid confusion and insure accurate work in samples sent him, Mr. Geo. C. Davis, chemist of Philadelphia, has gotten out a very neat card giving directions for sampling. The card is 9 in. wide by 6 in. high, printed on stiff white card board, with a hole punched near the top for convenience in hanging it up. These cards are sent out to foundrymen and to pig iron brokers, and should be found very useful. The card is reprinted herewith as sent out; however, reduced somewhat in size.

Mr. Davis, in a letter in reference to the cards, states that his object in designing the one in the form shown was to produce something of value to men of little or no experience in sampling. The card can be hung up in the office, or near the drill press, and hence is a good form in which to place such information. The type was made large so that it would catch the eye quickly. The reason for stating that each pig should be drilled in two places is that the sulphur varies more or less; hence, drillings near the top and bottom of the body should always be taken.

As drills ½ in. in diameter, or even larger, are used, the two holes will cover a considerable portion in the cross section of the pig, and should give a good enough average for all practical purposes. Some parties objected, stating that no sample should contain more than 10 pigs. As few carloads of iron exceed 40 tons, it is evident that a sample of the size specified would rarely contain more than 10 pigs.

Directions for Sampling Pig Iron.

Take one half a pig for each four tons.
Stand on end on drill press table.
Brush off end of pig.
Drill in two places, taking one-half ounce from each pig.
Pick up drilling with piece of sheet metal about 2 inches wide, by 4 inches long, bent V shape.
Place drillings in a tin box or patent seal envelope. The Beecher is a good one.
Mark car number and your name on the envelope.
Remarks: For very hard iron use a small, flat drill, specially hardened, and ream out with a larger drill made in the same way. White iron can easily be drilled in this way.

DO NOT

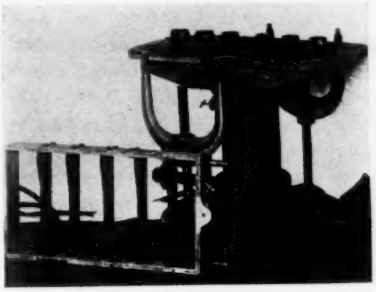
Use oil on the drill.
Drill a pig on its side, letting drillings fall on the table and then take them up with sand, oil, waste, wood, brass or steel chips.
Place drillings which are to be sent by mail in a gummed envelope. It will not hold them securely.
Take one pig from a car load for a sample.
Take large planer or lathe chips for a sample. The chemist wants fine drillings.

GEORGE C. DAVIS, Chemist,
39 South Tenth Street, Philadelphia.

One man wanted a pig for each two tons of iron, but Mr. Davis selected one pig for each four tons of iron to conform with the practice of the American Society for Testing Materials.

THE NORCROSS MOLDING MACHINE.

A new and very simple molding machine has been developed by the Norcross Molding Machine Co., of Terre Haute, Ind. This machine is shown in two positions in Figs. 1 and 2. The machine consists of a substantial base upon which is placed a



PATTERNS READY FOR MOLDING.

column containing a cylinder in which a piston, carrying the entire upper portion of the molding machine, is fitted.

In Fig. 1 the machine is shown ready to receive the flask, which is placed about the patterns and filled with sand. Air is then turned on by means of a valve connected

PATTERNS STRIPPED.

with the supply hose or pipe. The parts are so constructed that as soon as the air is turned on, the entire upper part of the machine, including the pattern plate, stripping plate, flask and sand, are raised and allowed to fall in such a way as to cause a rapid succession of blows of the lower end of the piston upon the base plate. This jars or rams the sand thoroughly. The mold is then struck off; the air turned on in such a way as to raise the table, when the table is given a rotation of 90 degrees and the air allowed to exhaust. As the air exhausts, the piston descends, taking with it the pattern plate; but the stripping plate with flask are kept upon suitable supports as shown in Fig. 2, and the patterns are thus stripped through the plate. The flask is then removed; the air once more turned on to raise the parts freer of the supports, when the machine is given a ¼ turn and dropped into position shown in Fig. 1, ready to receive the flask for the next mold.

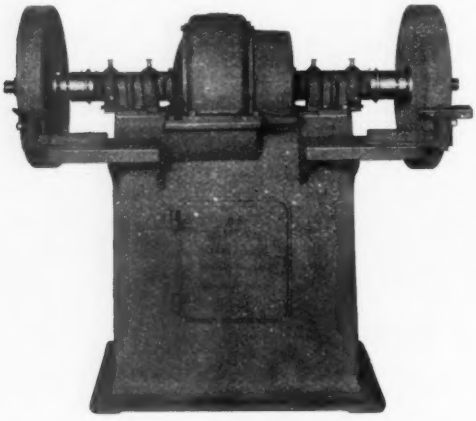
The parts are so constructed that the piston forms its own valve, and as there are no other working parts, there is nothing to get out of order or to be clogged with sand; in fact the machine is made as simple as it was possible to design it.

A MOTOR DRIVEN GRINDING STAND.

If there is any part of an ordinary manufacturing concern where running or exposed shafting should be avoided it is in the grinding room, with the presence of fine dust in the air which always occurs to some extent even when exhaust hoods are used over the wheels. This necessity is even greater in a grinding room of a foundry as the grinding room is usually connected with the cleaning room and there is always sure to be dust in the air. Such dust gets into the journals or shafting and not only wears out the shafting and bearings, but worst of all it is a constant drain on the profits of the concern, due to the increased friction which must be overcome to accomplish the work.

The enclosed motor driven grinding stand for these reasons commends itself very favorably to foundry users. The accompanying illustration shows a machine of this type made by the Bridgeport Safety Emery Wheel Co., of Bridgeport, Conn. As will readily be seen the machine is self contained so that it can be set down anywhere. The motor and bearings are so protected that it is impossible for dust to enter them. The motor is also so arranged that its speed can be varied to accommodate the changing diameter of the

grinding wheels as they wear down. The wiring is brought in through the base of the machine and the starting switch and controller are located in the base. Another point of interest is that the interior of the base and the space about the motor are connected, which results in a larger volume of air about the motor space to assist in keeping the motor cool. The machine has been very carefully designed, the motor having been designed to go with the machine and not the machine to fit a standard motor. The bearings are lined with phosphor bronze and provided with ring oiling devices. The motors are wound either for 220 or 500 volt current. They are also made either for direct or alternating current as conditions in the plant may dictate. One great advantage of electrically driven grinders of this type is that they can be utilized anywhere in the plant, as it is only necessary to run the wires to them to furnish them with power and there is no loss of power when the machine is not running, due to the friction of shafting, belting, etc.



A MOTOR-DRIVEN GRINDING STAND.

MANIPULATION OF MOLDING SAND.*

BY MR. VROMAN.

In the beginning I will say that I do not intend to treat the chemical side of the sand question very extensively as I have covered it is my "Treatise on Molding Sand." As the title of this paper indicates I will discuss the manufacture and manipulation of molding sand. The manufacture of molding sand is a possibility and owing to the scarcity of it is a probability in Chicago. The only thing which prevents the manufacture of it today is the cost as compared with the price of the sand now brought into this market and at that I question whether a manufactured sand would not be cheaper at a higher price. The sand beds now being worked are nothing but pockets and are of a varying quality and uncertain quantity. When a manufactured sand is once used in this market it will be here to stay, because the use of it will be so satisfactory that the foundries will not change back even at a lower price. A manufactured sand can be delivered uniform in grade and analyses. You could name your own formula and have delivered to you a sand absolutely perfect. Until the time arrives when the foundrymen will pay the price and the manufactured article is sold we will have to content ourselves with what nature has given us and learn to manipulate it to the best advantage. To begin with under the present conditions it is impossible to ship two cars of sand alike and I venture to say that I don't believe there is present a foreman who will say he ever received two cars alike. This is not a fault of the shipper but the sand.

I propose to show by actual experiment before you that through manipulation many of the faults now found with sand will be removed. I have here two samples of sand that I am going to change by mechanical process and so combine them that one will be entirely lost or taken up by the other. The first is a strong loam, very fine and too loamy to use for molding purposes. There is four ounces of it. The other is the ordinary No. 1 beach sand, such as is used for cores and entirely free from loam. There is six ounces of it. I use them because they represent the extremes in sand. I will now mix them together, as there are six ounces of the lake sand and four ounces of the loam, they will analyse, when mixed together, 60 percent of free sand and 40 percent of loam, a fair analysis for molding sand suitable for heavy work. I will now add a little water, just enough to bring it up to a temper suitable to mold with by rubbing it through my hands a few times. I am now able to hand out to you a sample of molding sand; for uniformity and texture its equal cannot be found in nature. The lake

*Paper read before the Chicago Foundry Foremen, December 16, 1905.

sand has lost its identity and is taken up by the loam and when dry will not separate but remain in combination with the loam.

The operation is simple and easy by hand but it is much easier when mixed by machinery. The samples are small but large enough to demonstrate that it lies within the power of the foundrymen to change his sand to suit his work and at a trifling cost. It must be clear to you that if we are able to combine two sands so different and bring them into one homogeneous mass that there will be no trouble in combining two or more sands which are alike chemically and differ only in the amounts of their constituents, and as a proof of the practicability of blending two different sands, I will make a further demonstration by mixing together a coarse and fine sand, using 50 percent of each, both sands are familiar to you all. The fineness of these two sands has been determined by passing a sample over five different mesh sieves from a No. 20 to a No. 100. The amounts passing through each sieve are added together and divided by five, the number of sieves used, to get the average amount passing through all sieves.

Coarse Sand.

20	Mesh	Percent	96.08
40	"	"	72.60
60	"	"	26.77
80	"	"	21.05
100	"	"	15.40
			5)231.90

Average Fineness of Coarse Sand 46.38

Fine Sand.

20	Mesh	Percent	98.87
40	"	"	83.24
60	"	"	67.72
80	"	"	63.16
100	"	"	54.11
			5)367.10

Average Fineness of Fine Sand.....73.42

The two sands when thoroughly mixed together give the following:

20	Mesh	Percent	97.47
40	"	"	77.92
60	"	"	47.24
80	"	"	42.10
100	"	"	34.75
			5)299.48

Average Fineness 59.09

This mixture can be used to increase the coarseness of the fine sand or to reduce the coarse sand to a finer grade. An examination of these blended sands will show that they incorporate perfectly and the resultant sand is an improvement over either. The average fineness of these two sands taken separately is as follows:

Fine Sand Average Fineness.....73.42%
Coarse Sand Average Fineness.....45.38

Difference 27.04

By the above it will be seen that there was 27.04 percent more of the fine sand passed through all the sieves than there was of the coarse sand and is therefore that much finer. By referring to the fineness of the blended sample it will be seen that the average percentage that passed through all the sieves is 59.9 percent, a grade just between the two sands. You have increased the coarseness of the fine sand to the extent of the difference between the average fineness of the blended sand and the original sample as follows:

Average fineness fine sand.....73.42%
Average fineness blended sand.....59.9

13.52%

The increased coarseness of the fine sand. On the other hand you have made the coarse sand finer to the same extent that you have made the fine sand coarser. The experiments shown represent but two of the many mixtures that can be made from the sands of this district. It will require a machine to manipulate your sands in this way and for that purpose I would suggest a dry pan with two large rolls, such as used in a brick yard. They are not very expensive and every foundry should have one. And all the sand whether mixed with other sands or not should be put through a machine of this kind before being used, this insures a uniform mass. By so doing you can use up all the lumps and avoid waste and correct a bad car of sand. For example let us say you receive a car of sand which is too open for your work, all you have to do is to go to your loam pile and add enough of it to bring your sand up to strength. If your sand is too strong use a little core sand and you have got what you want.

You need not be afraid that the sand will not stand by these additions as both the loam and core sand are as refractory as the sand you use. One stands up un-

der the iron in the core, the loam the heat of the cupola, consequently they will stand the heat when mixed in your sand. The dry pan is useful in other ways and can be used for mixing facing sand and should you run short of seacoal, go to the boiler room for a barrow of soft coal and you can grind your seacoal or a trip to the coke pile and you can make your own coke blacking. It might not be as finely ground as what you buy, yet it will answer in a pinch. Although I have both of the above named articles for sale I do not hesitate to put you wise to a good thing. In analizing your sand an analysis for loam and silica is all that is necessary; paying careful attention to the loam.

You can determine the limit to which the percentage of loam can be used with safety; base all your calculations and mixtures on the loam contents of the sand. What silicon is to the iron the loam is to the sand, the controlling element and if you see that the proper amount of loam is contained in your facing sand and the sand that goes into the renewal heaps you will have no trouble. I do advocate, however, the testing of your sand through five standard sieves from No. 20 to No. 100 mesh so as to gauge your sands for fineness. I do not think it necessary to go into the structure of the grain as I do not think the shape of the grain has anything to do with the wearing qualities of the sand.

I once held the theory that some sands were conductors of heat and others were not, and where a sand was composed of grains which were conductors of heat it would burn out faster than a sand the grains of which were not conductors of heat and through an established rule of chemistry that all clays and substances lose their water of crystallization at red heat, a sand which being a conductor of heat would carry this red heat to a greater depth into the mould than a sand which was not a conductor of heat. The loss in sand being equal to the depth that the red heat had penetrated. Investigation along these lines did not prove this theory correct.

In conclusion let me say there is open for your association, a field on the subject of sand in which you can do a world of good and I suggest that you take up and determine what shall constitute a given grade of sand, both in fineness and analyses. It would be a comparatively easy task for you to take up and grade the sands of this district and I know the results of your labor would be a benefit to you and the shippers of sand as well and I am satisfied that the standards which your associations will set will become the standards for all foundries. should you decide to undertake the grading of the sands of this district I will be pleased to co-operate with your association and furnish you with any advice or information I may have and will assist in any investigation you decide to make.

HEATING AND VENTILATION OF FOUNDRIES.

BY HARRY MALONE.

The ordinary foundry presents a very difficult heating and ventilation problem. The conditions at different times of the day vary so greatly that it is difficult to design a system which will keep the building at anything like a uniform temperature. In the morning the building is usually cold on account of the heat being allowed to fall during the night. The sand heaps are then wet down and cut up. This also tends to cool the building and to make it damp.

In the cleaning department the cleaning of the castings, unless it is conducted by means of exhaust mills, produces great quantities of dust and, hence, the air in this department has to be changed rapidly. The air in the foundry proper does not require rapid changes on account of the volume of air necessary for the workmen to breathe, as each man usually has a relatively large volume of space to work in.

In the afternoon during the pouring, the conditions are reversed, and in place of the sand giving up damp, cold mists, we find the building full of molds that have just been poured, from which smoke and hot steam are rising. The result is that the temperature of the room rises rapidly and the air naturally becomes laden with smoke and dust.

We know of one foundry that is heated entirely by stoves, and the system seems to be very efficient. The pipes from the stoves are carried to a large central pipe sup-

ported from the foundry roof and terminating in a stack at the center of the building. It is the duty of one laborer to see that all of the stoves are kept supplied with fuel and to carry away the ashes. The foundry management state that the system works very efficiently, as if the building gets a little too cold, the workmen will push the laborer around and see that he keeps his fires going. Each stove, however, takes up considerable valuable floor space, and in a heavy work shop the pipes would be in the way of cranes, hoists, etc., but as only snap flask work is done in the plant mentioned, this objection is not presented.

Foundries are also sometimes heated by steam coils, either suspended overhead or placed along the walls.

No building can be properly heated unless some provision can be made for heating any air which is introduced into the building. For this reason steam pipes located below the windows are more efficient than those placed in any other position, as there is always more or less leakage about windows, and if there are steam pipes below them, the warm air rising past the window will blend with any cold air and result in uniform heating.

It is undoubtedly true that the ideal method of heating a foundry is by forcing warm air into the building by one of the blower systems now so generally adopted, but we know of a great many cases in which the heating engineers have fallen down badly in their attempt to heat foundries with apparatus of this description. Such failures are usually due to a miscalculation of the conditions existing in the foundry.

In the first place most foundry buildings are large, open structures, having a very large exposed area of wall, roof and windows, from which the heat can escape; second, owing to the heat and dust during certain parts of the day it is necessary to open a good many ventilators, and this allows the heat to escape rapidly. Probably the best method is to maintain such a pressure by the blower system, so as to insure an outward leakage around all windows and through all ventilators.

At first sight this looks a great deal like heating up all outdoors, but the increased efficiency of the workmen, who never have to stop to warm their hands, and also the fact that where the building is properly heated the workmen are not subject to colds and less liable to be absent, are both facts to be taken into consideration and will more than compensate for the extra expense incurred in heating. During the morning considerable steam should be used in heating the building and the air should be from 60° to 65° Fahr. After pouring off begins a larger volume of air is necessary to sweep the steam and smoke out through the ventilators. This can usually be obtained by increasing the speed of the fan without changing the adjustment of the steam valves. The result will be a larger volume of air at a lower temperature, the lower temperature being compensated for by the heat from the molds and the larger volume of air serving to sweep out the steam and smoke.

During the night the handling of the heating will depend largely upon the character of the work being done. If it is light snap work, the smoke and steam will all be out in an hour or two, and after that the fan should be slowed down and only a small amount of air circulated. At this time the air for the heating coils should be taken from the foundry, thus conserving the heat to the greatest possible degree.

If the sand is cut up by the night men and the temperature raised to 60° before the day force comes on, the men will start under conditions which enable them to put up a maximum day's work. If, however, the product of the foundry is heavy floor work, the night gang may require until after midnight to get the molds opened up and the castings out. In such a case it may be necessary to keep the heat in the building all night and to draw the majority of the air for the heating coils from outdoors.

In any case it will pay to have the foundry warm when the men begin work. Most foundrymen kick about waste of any kind, but they will permit the men to congregate around a stove or salamander to warm their hands, forgetting that all that time they are throwing away the wages of the men, not to mention the fact that when they do return to work they are unable to work to the best advantage if everything handled is uncomfortably cold.

Heat and good air are two things that any employer can furnish his workmen and for which he will always receive a large reward in increased output and more efficient work.

Niles Anderson succeeds E. B. Blandy as the New York representative of Matthew, Addy & Co.

PERSONALS.

A. J. Hill has been appointed superintendent of the foundry department of the Anaconda Copper Mining Co., of Anaconda, Montana, to suceed J. S. Hickey who recently resigned. J. S. Goodwin is to be assistant superintendent. Both Mr. Hickey and Mr. Goodwin have grown up in the department, which was formerly known as the Turtle Works, and since it was absorbed by the copper company has been developed into the largest manufacturing plant of its kind in Western Montana.

O. M. Stowe, for the past ten years secretary and treasurer of the Union Malleable Iron Co., Moline, Ill., has resigned and will become purchasing agent of the Janney Mfg. Co., now at Ottumwa, Iowa, but which is soon to remove to Columbus, Ind. At its new location the Janney company is building an extensive plant for the manufacture of farm implements. Mr. Stowe will be a stockholder in the company.

James S. Church, formerly superintendent of the Milwaukee plant of the Allis-Chalmers Co. is to be at the head of the new school of trades which is to open in that city, probably on Dec. 1. He is vice president of the Milwaukee Boiler Co.

E. W. Blandy, New York representative of Mathew, Addy & Co., will take charge of the Eastern sales offices of the Tennessee Coal & Iron Co. The office will be located at No. 5 Broad St. and the territory covered will include the New England, the Middle and several of the Southern states.

Nat H. Ashley will sever his connection wih Matthew, Addy & Co., Dec. 1, to accept a position with the Robert Field Sales Agency. Mr. Ashley was with Rogers, Brown & Co. at Buffalo for twelve years and with Matthew & Co. for the past two years.

T. Frame Thompson has been added to the directorate of the Otis Steel Co., Cleveland, the number of directors having been increased to four. The others are J. T. Smith, chairman; J. E. Touch, managing director; and Frederick Walker, all of London, Eng. George Bartol continues general manager.

Geo. K. Hooper, mechanical engineer of 11 Broadway, New York, is remodeling and enlarging the foundry of the Gould & Eberhardt Co., of Newark, N. J. and has just completed some professional foundry work for the Farrel Foundry & Machine Co., of Ansonia, Conn.

Irie T. Chappell has accepted the position of foreman of the Household Sewing Machine Co.'s foundry, at Providence, R. I.

Kirt Chappell has resigned the foremanship of the Household Sewing Machine Co.'s foundry at Providence, R. I., to start a new foundry at Warren, R. I., for the Textile Finishing Machinery Co., of Providence, R. I.

Geo. W. Downing, for the past five years foreman of the Stanton Foundry & Machinery Co., of Palatka, Fla., has resigned and accepted the position of chief engineer of Putnam house.

DEATHS

George M. Ballard, of Newark, N. J., died on Dec. 4 from the effects of an operation. Mr. Ballard was 68 years old and most of his life had been spent in the iron business. He was first associated with William Stainsby and John Barnett in manufacturing saddlery hardware, but later operated a malleable iron foundry in Newark.

Maurice Griffin, who has for the past six years been foreman of the Toledo Foundry & Machine Works, died at his residence in Toledo on November 23. Mr. Griffin was 59 years of age and had lived in Toledo all of his life.

Samuel Wallace, White Haven, Pa., a pioneer foundryman, died October 31, at the age of 77. He was the owner of the White Haven Iron Works.

P. B. Acker, vice president of the Union Stove Works, New York, died at his summer home in Peekskill, N, Y., Dec 9, after an illness of two months. He was for many years a resident of East Orange, N. J., and a member of the New England Society of that place. In 1904 he was elected president of the National Association of Stove Manufacturers. The foundries of the Union Stove Works are located in Peekskill.

FIRES.

The Wenzelmann Mfg. Co., Galesburg, Ill., sustained a loss of about $8,000 by fire Nov. 1. when the foundry was burned to the ground.

The Westmoreland Specialty Brass Co., Grapesville, Pa., sustained a loss of about $25,000 on Dec. 3, due to fire in the foundry department of the plant.

The Pittsburg Gauge & Supply Co., sustained a $35,000 loss by fire Dec. 6, the heaviest damage being in the pattern department department of the plant.

Illinois Steel Co., Chicago, suffered a costly fire Dec. 4 in the pattern shops of its North Works, Chicago, in which a large number of valuable patterns was destroyed.

The Graff Stove & Range Co., Pittsburg, sustained a practically complete loss of its plant by fire Dec. 1.

The foundry of the Evans Mfg. Co., Butler, Pa., sustained a $5,000 loss by fire Nov. 19.

The plant of the Walsh Brake Shoe & Foundry Co., near East Moline, Ill., was destroyed by fire on November 16. A large number of very valuable patterns were lost and 120 men were thrown out of work. The owners are considering a change to a site where they can be in closer touch with shipping facilities. The plant was located in what is called the East Rock Island addition.

A serious fire occurred in San Fransisco, Cal., on November 29 destroying the plant of the Golden State Miners' Foundry Co., and a portion of the plant of the Union Iron Works. Both companies lost valuable patterns and the total damage done will amount to $250,000, including losses to adjoining buildings.

The foundry plant of Doherty Bros., of Lowell, Mass., was destroyed by fire on December 5.

The Milmine Foundry, at the corner of Field and Railroad avenues, Toledo, O., was damaged by fire to the extent of $1,500 on November 26.

The foundry of A. C. Thompson & Co., of Lunenburg, N. S., was destroyed by fire on November 24. The loss was $23,000, with insurance of $13,400.

The entire west plant of the T. H. Brooks Foundry Co., Cleveland, was destroyed by fire Nov. 24, the loss being placed at $50,000. The plant was devoted to structural and ornamental work and contained pattern, machine, fitting and structural shops. The other section of the works was not injured and operations have already been resumed, so that little delay will be occasioned in the filling of orders on hand. The burned plant will be rebuilt at once and such machinery as was ruined will be replaced. The Otis Steel Co., located just across the street, escaped any loss of consequence.

NEW CONSTRUCTION.

At a recent meeting of the Council in the city of Utica, N. Y. it was decided to abandon Hutchinson avenue to give the Utica Pipe Foundry Co., room to double the capacity of its plant.

The new plant, including the machine shop and foundry for the U. S. Boiler & Radiator Works, of Corry, Pa., has been pushed to completion as rapidly as possible on account of the large amount of work on hand.

The new open hearth department of the Sharon Fdry. Co., at Wheatland, Pa., has been opened.

The Detroit Stoker & Foundry Co., of Detroit, Mich., has taken out a building permit for the construction of a $5,000 addition to its plant.

The Russel Wheel & Fdry. Co., Detroit, has under way additions to its plant which will increase its capacity 100 per cent. A foundry building, 150 x 386 ft. is being erected and a factory for construction work will be 90 x 140 feet.

The J. P. Rundle Mfg. Co., Milwaukee, Wis., is preparing plans for improvements at its plant to cost $30,000. A one-story addition 85 x 113 ft. will double the capacity of its foundry. A new melting and refining building, a brass finishing building, office building and shipping depot are also to be constructed.

The Monarch Coupler Co., Detroit, has let the contract for the erection of a new steel casting plant adjoining its property at Delray. The plant when completed will occupy four acres. The steel work will be furnished by the Russel Wheel & Fdry. Co., Detroit; the ovens by Wm. Smythe & Sons of Pittsburg; and the cranes and similar machinery by the American Engineering Co., Detroit.

The Charles A. Stickney Co., St. Paul, Minn., is erecting a foundry building at a cost of $10,000.

It is reported that the J. L. Mott Co., of Trenton, N. J., has practically decided to build a plant for the casting of iron bath tubs, the building to be commenced in the spring.

The Essex Foundry, Newark, N. J, finds it necessary to erect a new building which will be 113 ft. long and 75 ft. wide. New molding machines will be installed besides other necessary equipment.

When the improvements are completed the daily capacity will be about 50 tons.

The Chapman Iron, Coal & Coke Co., of Goshen, Va., whose plant was recently destroyed by fire, will rebuild its machine shop and foundry in the near future.

Payne & Joubert, New Orleans, La., have purchased nine acres of ground at East Birmingham, Ala., and propose to erect a factory, including foundry and machine shops, for the manufacture of engines and sugar mill machinery.

The new foundry of the Muncie Foundry & Machine Co., located in Industry, Muncie, Ind., is being rapidly pushed to completion.

The Hetherington & Berner Co., Indianapolis, Ind., will erect a new foundry on a tract of 3½ acres recently acquired. The new location affords excellent railway shipping facilities.

Henry Ehret, who recently sold his interests in the Enterprise Foundry Co., at Belleville, Ill., has let a contract for a new foundry building 60 x 212 ft.

The work on the new building for the Geneva Foundry & Machine Co., at Geneva, Ill., has been progressing rapidly.

The Reder Foundry Co., Chicago, is erecting a foundry 90 x 91 ft., and a pattern shop 76 x 103 ft. and three stories high, at its plant at Canalport avenue and Johnson street. The buildings will cost about $40,000, and will be constructed of brick and steel.

The new steel foundry of the Prescott Co., at Menominee, Mich., was damaged by a tornado on November 24, one of the walls being destroyed and the roof of one of the buildings being injured. An extra force of men was set to work and the damage repaired quickly, so that the completion of the plant will not be set back by the accident.

The Belle City Malleable Iron Co., of Racine, Wis., is increasing the capacity of its plant from 7,000 to 10,000 tons per year. The company will erect two new buildings, one 100 x 200 ft., containing two new furnaces, and one 80 x 100 ft., containing four new annealing ovens. Both buildings will soon be completed.

The Standard Roller Bearing Co., of Phila, Pa., has purchased the property of the Pennsylvania Iron Co., at Forty-ninth street and Merion avenue. The brass foundry and several departments of the Roller Bearing Co. will be moved into the recently acquired property.

The corner stone of the new machine shop and pattern department of the National Tube Works of McKeesport, Pa., was laid on November 25. There was no social ceremony, but a copper box containing local newspapers and other records was deposited in the stone.

The new plant of the Scranton Steam Pump Co., of Scranton, Pa., replacing the old plant which was burned last July, is now in full operation. The new structures are of steel and concrete and everything has been made as nearly fireproof as possible.

The Wm. Wharton Jr. Co., Inc., of Phila., Pa., has nearly completed the reconstruction and enlarging of the buildings on the property adjoining its old plant which was purchased some time ago. The pattern shop and pattern storage, together with the fitting shop, will be located in the new buildings. The pattern storage will be connected with the foundry by an overhead bridge. Arrangements have also been made for the storage of sand and other supplies in the new buildings.

Plans for the new Fort Pitt Steel Casting Co., of McKeesport, near Pittsburg, Pa., have been completed. A plot of ground has been leased near the Baltimore & Ohio Railroad tracks upon which to erect the works.

The Champion Blower & Forge Co., Lancaster, Pa., is erecting a foundry 70 x 360 ft. of structural steel. Complete foundry equipment, including three Paxson-Colliau cupolas and general supplies has already been contracted for. Some additional requirements will probably be needed within a short time.

The United States Radiator Co., West Newton, Pa., is building an additional warehouse 50 x 200 ft. two stories. A two story extension 50 x 180 ft. will be made to the foundry in a short time.

The Monessen Foundry & Machine Co., Monessen, Pa., is erecting a new machine shop 80 x 130 ft., and an addition to the foundry 50 x 72 ft. They will install two 10-ton traveling cranes.

The 20th Century Heating & Ventilating Co., of Akron, O., is building a new foundry that will be in operation by Jan. 1

The new foundry being erected by the Ohio Cultivator Co., of Bellevue, O., is practically completed and ready for work.

The Interstate Foundry Co., of Cleveland, O., is erecting a new annealing oven, a contract for it having already been let to Hanahan & King.

The Wm. Bayley Co.. of Springfield. O., has completed a new 4-story storage building for its patterns, also a new foundry.

The Lattimer-Williams Mfg. Co., Columbus, O., intends erecting an addition to its foundry, a ware-room and storage building and a cleaning room. The company manufacture stoves and ranges.

The Potthoff & Fry Iron Works, Cincinnati has decided to erect on a site recently purchased what will be the second largest structural iron plant in the city.

GENERAL INDUSTRIAL NOTES.

The annual meeting of the stockholders of the Kettler Brass Mfg. Co., of Houston, Texas, was held October 31. The following directors were elected: M. F. Kettler, W. D. Elliott, J. G. House, Hubert Sullivan and Fred L. Sehnert. After the stockholders' meeting the directors met and elected the following officers: M. F. Kettler, president and general manager; Hubert Sullican, vice president; J. G. House, secretary and treasurer. The business was formerly located in Dallas, but was moved to Houston by Mr. Kettler, so as to be nearer the large manufacturing interests of the state.

The Fort Worth Machine & Foundry Co., of Fort Worth, Tex., has been formed by the consolidation of the Acme Metal & Machine Co., the Fort Worth Boiler Works and the Fort Worth Machine & Foundry Co. Mr. M. P. Feris has furnished additional capital for the company. The new officers are William Richmond, president and general manager; M. P. Feris is vice president; and Chas. E. Bowman, secretary. The capital of the company is to be $60,000. A general machine shop and foundry business will be carried on.

The Canon Foundry & Machine Co., of Canon City, Colo., which is composed of J. M. Shutz, O. W. Betts, and J. A. Marsden, reports that its business is rapidly increasing and that prospects for the future are very bright.

The Ideal Pump Co., of Greencastle, Mo., is moving its plant to Green City, Mo. The company's new foundry will be 56 x 150 ft. and will be equipped with the latest design of foundry appliances.

The Murphy Fixture Co., of Dallas, Tex., has been organized to manufacture all sorts of brass castings and other brass and iron work.

The Cast Steel Needle Beam Co., St. Louis, Mo., has been incorporated to manufacture truss rod beams for railroad cars, etc. The capital stock is $100,000.

The Pratt & Whitney Co., of Hartford, Conn., has purchased a plant in Dundas, Ont., where it will manufacture its full line of small tools—taps, reamers, milling cutters, punches, dies, etc. The equipment for the plant is to be manufactured in Hartford and shipped to Dundas.

On November 5, President Diaz, with the members of his cabinet, and a large party of invited guests, visited the plant of the Mexican Car & Foundry Co., which has recently been established near Mexico City, Mexico, by Chicago, Pittsburg and New York capitalists.

In order to establish a branch stove foundry at Vancouver, the Record Stove Foundry, of Moncton, N. B., proposes to increase its capitalization from $800,000 to $1,000,000.

The old Menzel & Jeffrey foundry is being converted into a 6,000-ton cast steel plant by the Washburn Coupler Co., Minneapolis, Minn. The new plant will be ready by Jan. 15 and will on day and night shifts, give employment to about 60 men.

The U. S. Brake Shoe Co., with head offices at 15 Exchange Place, Jersey City, N. J. has been incorporated with a capital of $500,000. The incorporators are John H. Galleher, Elmer Rodrigo and Henry B. Corey.

The New York Steel & Foundry Co., 15 Exchange Place, Jersey City, N. J., has been incorporated with a capital of $100,000, to manufacture cars, etc. The incorporators are Louis B. Dailey, Charles A. Taussig and William Howard Jr.

The South Baltimore Steel Car & Foundry Co., of Baltimore, has increased its capital stock from $1,000,000 to $1,500,000 for the purpose of developing its plant at Curtis Bay, near Baltimore.

The Taylor Iron & Steel Co., High Bridge, N. J., at a recent meeting made several changes among the officers of the company. Robert E. Jennings, president of the Carpenter Steel Co., Jersey City, was elected to take the place of Lewis H. Taylor resigned. Percival Chrystie was chosen vice president and Knox Taylor general manager. Mr. Taylor's resignation has been very reluctantly accepted and in so doing the board has

unanimously elected him honorary president.

A. M. Danbery, of Maysville, Ky., has purchased the Ripley, (O.) Foundry & Machine Co's plant and will operate it in connection with his foundry in Maysville.

The Taylor Iron & Steel Co., Knoxville, Tenn., has let the contract for a 200-ft. extension to its steel foundry to the Eastern Steel Co.

The foundry department of the Bonham Foundry & Wood Works, of Bonham, Texas, commenced work on December 1. The foundry is operated in connection with the Rapid Fire Hay Press Co., the company having been reorganized and the name changed to the Bonham Foundry & Wood Works. The officers are C. C. Riddings, president; Frank Teague, vice president; W. A. Peters, secretary treasurer.

The Sioux City Foundry Co., of Sioux City, Ia., is planning to construct a new foundry.

The Pacific Coast Elevator & Machine Co., of Tacoma, Wash., has been incorporated with a capital of $5,000. The incorporators are J. Bamford and M. S. Gilbransen.

The Union Boiler Co. has been organized at Pennington, N. J. by Chas. O. Lyon and Edward Benedict. The new company will take over the plant of the Pennington Foundry & Heating Co., and will manufacture boilers.

The Golding Mfg. Co. of Boston, Mass., which recently purchased the Bassett Straw Works on Dean avenue, Franklin, Mass., is having the plant repaired and re-arranged to suit the requirements of the business. The foundry will be the first part to be put in shape but it is probable that the company will move all departments to the new location in the spring.

Warren & Williams, 21 Eddy St., Providence, R. I., have started a small silver and gold foundry. The Cutter, Wood & Stevens Co. of Boston, Mass., furnished the equipment.

The fixtures of the City Iron Foundry, Woonsocket, R. I., have been sold, as the plant will not be operated as a foundry by the Joseph Hoyle Bobbin Co., who recently purchased it. The Clark Machine & Foundry Co., of Franklin, Mass., bought half of the fixtures and Charlette Bros. the remaining half.

The Household Sewing Machine Co's foundry at Providence, R. I., was sold at auction on Dec. 4 to Wm. J. Dunn, of Fall River, Mass., who will continue to run the foundry under the name of Dunn Bros.

Charlette Bros. have purchased the foundry formerly known as the Barr Bros. Iron Foundry, at Woonsocket, R. I., and are now operating it.

The Briggs Iron Works, Albany street, Springfield, Mass., recently incorporated, are installed in a good sized plant well adapted for foundry purposes. A high grade of gray iron castings will be turned out. G. W. Briggs is superintendent.

Horace L. Hotchkiss has been elected a director of the Central Foundry Co., whose head offices are in New York, to succeed Gerard Schumacker, who will continue to act as second vice president of the company.

The Miller Foundry & Specialty Co., North Tonawanda, N. Y., has been incorporated with $30,000 capital stock to carry on a foundry, plumbing and heating business. The incorporators are: Alice M. Miller, George O. Miller, and Amos Miller, all of North Tonawanda.

The David Bell Engineering Works, Buffalo, N. Y., has been incorporated to manufacture boats, barges, castings, engines, boilers, etc., with a capital of $30,000. The incorporators are: David Bell, George H. Bell, Harris T. Dunbar, Henry D. Mills and Frederick C. Slee, all of Buffalo.

A charter has been applied for by the T. B. Wood's Sons & Co., of Chambersburg, Pa. The incorporators are Geo. A. Wood, T. M. Wood, Chas. O. Wood and Wm. H. Fisher. The new corporation will take over the business of T. B. Wood's Sons, the well known iron founders.

Samuel H. Caufman, Chester, Pa., has opened a local foundry supply house and is desirous of receiving from the trade catalogues and prices of various foundry supplies.

The Butler Car Wheel Co., Butler, Pa., is soon to apply for a charter, through T. H. Gillespie, William Bierman and John M. Hansen of the Standard Steel Car Co. It is stated that a plant will be erected in Butler where the company owns considerable land. The new company will manufacture iron and steel castings, car wheels and forgings and articles of iron and steel used in the manufacture of rolling stock, machinery, etc.

M. J. Drummond & Co., of New York, who recently secured the cast iron pipe works at Reading, Pa., have begun operations under the name of the Drummond

Pipe Works. They have also leased a portion of the old Mellert Works. W. C. Foster is general manager of the plant, and A. H. Mellert is superintendent.

The Hydraulic Machine Co., Pittsburg, operating a steel, iron and brass foundry, has decided to divide its plant and organize the Iron City Steel Casting Company, to operate the steel casting department. The plant will be enlarged and two 10-ton open hearth furnaces will be added to the present 15-ton furnace, giving the plant a capacity of 1,000 tons per month. Three additional cut-off saws, two additional cleaning barrels, seven emery grinders, two shapers, two planers and three lathes, and a new 150 h. p. engine will be installed in the finishing and cleaning department.

The Buckeye Gas Engine Co., Delta, O., has purchased the business and plant of the Underwood Mfg. Co., at Elmore, O., and will move the plant to Delta at once, where an entire block in the Sargent addition on Oakwood avenue has been purchased as a site. The first building will be 55 x 108 ft. and a complete foundry will be installed in the spring. The incorporators are C. C. Reed, J. M. Longnecker, F. Briggs, C. R. P. Waltz, N. F. Carmon, W. T. Saxton, O. J. Wisman, G. R. Anderson, A. J. Fraker, John Latzer, Byron Yarnell, W. E. Fowler, and W. E. Ramsey.

The Steel Foundry Co., of Cincinnati, O., has been incorporated with a capital of $100,000 and will erect a large plant for the manufacture of steel castings. The incorporators are Franklin Alter, William Lodge, J. F. Ellison, M. M. Robertson, Harry L. Manss and Robert Wuest.

The American Malleable Castings Co., of Marion, O., has been incorporated with a capital of $100,000. The incorporators are Gustav Von Den Steinen, W. C. Merrick, Horace Andrews, W. B. Stewart and Edw. Akline.

The Lee & Riskey Co., of Loveland, O., has taken charge of the Loveland Foundry Co.'s buildings and will make steel castings, most of which will be used in the construction of a form of steel coupling invented by Mr. Bixby, one of the stockholders of the company.

The Youngstown Furnace Co., Youngstown, O., will operate the plant of the Geo. B. Sennett Co., which has been closed for the past two years.

The Challingsworth Foundry & Machine Co., recently incorporated for $150,000 expects to locate in Mt. Vernon, O., where it will manufacture air-furnace and semi-steel castings, gray iron castings up to 30 tons and brass castings. C. M. Stamp and H. C. Challingsworth, formerly with the C. & G. Cooper Co., of that city, will have an active interest in the company.

The Simpson Iron Co. has sold its foundry to the Safety Meter Lock Co., Columbus, O. The foundry has been overhauled and put in operation and is used to manufacture the company's various locking and stop cock devices.

The Troy Foundry & Machine Manufactory, has been incorporated with a capital of $10,000, at Troy, O. The incorporators are J. W. Morris, John Hoban, John Headly, Morris Coombs and William Harp. It is really a new incorporation of an old industry, the foundry being situated in the western part of Troy, close to the Troy and Piqua branch of the C. H. & D. R. R. The specialty of the plant is soil pipe.

The American Scrap Iron Co., Akron, O., has increased its capital stock from $25,000 to $50,000. Jacob Adler, president of the company, is authority for the statement that a number of improvements will be made in the near future, which will enable the company to do business on a much larger scale.

The Youngstown Foundry & Machine Co., Youngstown, O., among other large contracts is to furnish much of the material for the construction of the plants of the Youngstown Sheet & Tube Co. and the Republic Iron & Steel Co., at Haselton, Pa.

The Zanesville Malleable Castings Co., Zanesville, O., has acquired the plant of the Zanesville Malleable Iron Co., and will install many improvements. The officers and directors are: Frank Moore, Pittsburg, president; Harry A. Hall, Pittsburg, treasurer; J. M. Barringer, formerly with the Buckeye Malleable Castings Co. of Columbus, general manager; J. T. Gardner, Ridgeway, Pa., and H. A. Sharpe, C. T. Marshall and J. F. Brown of Zanesville, directors.

The Indiana Foundry & Machine Co., South Bend, Ind., is installing a new electric crane and is also planning to erect additional buildings in the near future, its present headquarters being too small.

The Sycamore Foundry Co., of Sycamore, Ill., has been incorporated with a capital of $30,000 to manufacture machinery, tools, etc. The incorporators are F. B. Townsend, W. R. Tapper and Frank C. Patten.

The Brown Specialty Machinery Co., of Chicago, Ill., announces that it has closed a contract with the Thos. W. Pangborn Co., of New York City, giving them the exclusive sale of the Hammer core machine and equipment for the states of Pennsylvania, Delaware, Maryland, Virginia and West Virginia, in addition to New York, New Jersey and New England, heretofore controlled by them. Under this contract the Pangborn Co. absolutely controls all sales in the territory mentioned, and all agents, dealers and jobbers are requested to make their arrangements with the Pangborn Co.

The Western Foundry Co., of Manitowoc, Wis., has been organized by Edward Hoffman and Louis Grimm. A plant is being erected on Wollmer street and preparations made to begin business at an early date.

The Fairbanks-Morse Co., of Beloit, Wis., is constructing an addition 75 x 80 ft. to the machine molding department.

J. L. Curtz has purchased the interests of Casper Schweitzer in the Champion Brass Works, of Coldwater, Mich. Mr. Schweitzer will engage in business elsewhere.

The Cadillac Motor Car Co., Detroit, Mich., has acquired the entire business and interests of the Leland & Faulconer Mfg. Co. and the Cadillac Automobile Co. The policy of the new company will be controlled by substantially the same officers and management that directed the affairs of the constituent companies. The Leland & Faulconer plant is devoted to motor construction.

The Northwestern Steel & Iron Works, Eau Claire, Wis., have just completed and put in operation their new plant. A large number of castings for concrete block making has been turned out. The plant is equipped throughout with modern machinery and tools.

The Grand Rapids Malleable Iron Co. has sold its plant in Grand Rapids, Mich., to the Chicago Railway Equipment Co., Chicago.

The Western Steel & Iron Works is a new company which has been incorporated at Green Bay, Wis., with a capital of $40,000. The incorporators are R. T. Jenney, C. W. Van De Walker, and G. W. Cate. The new company will take over the entire business of the Western Steel Gate Co., with its foundry and machine shop.

The Wheeling Enameled Iron Co., of Wheeling, W. Va., has been incorporated with a capital of $125,000, $80,000 of which is paid in. The new company was incorporated to take over the Wheeling Heating & Ventilating Co.'s plant at Elm Grove, the latter company being now out of business. The new company will manufacture a line of heavy enameled iron ware, such as bath tubs, sinks, lavatories, etc. Wheeling capital is interested in the business. The officers are Chas. W. Franzheim, president; Wm. A. Isett, vice president; Geo. W. Franzheim, secretary, and Geo. Blackham, factory manager.

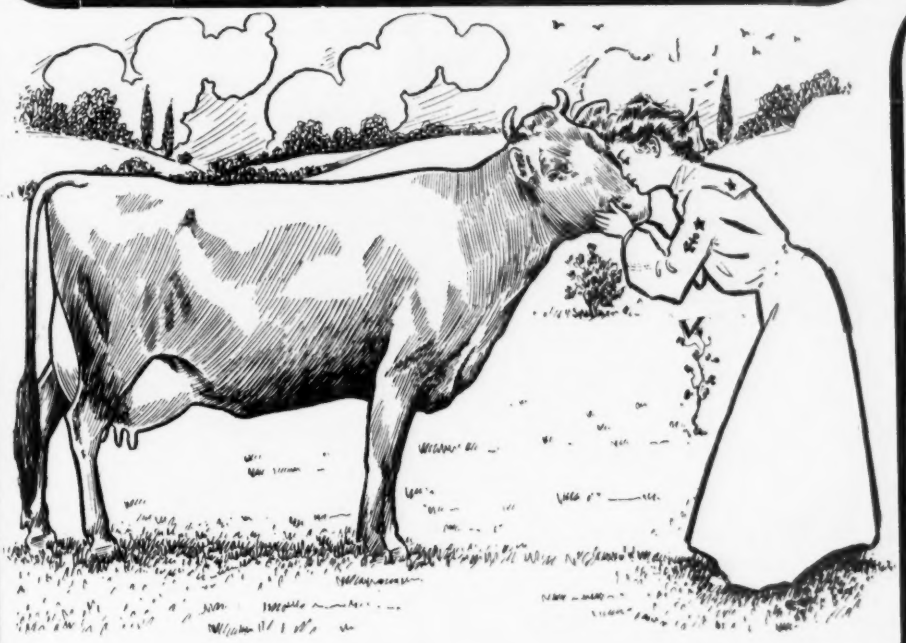
The Virginia Pipe & Foundry Co., of Richmond, Va., has been incorporated with a capital of $50,000. The officers of the company are Thomas Wheelwright, president; Christopher Manning Jr., vice president; Harry Wayt, secretary and treasurer. The plant will be located on Belle Isle and will be used for the manufacture of soil pipe.

The East St. Louis Foundry Co., East St. Louis, Mo., has been incorporated with a capital of $40,000. The incorporators are: M. B. Nolan, Edward L. Cregan and R. B. Hendrichs.

Headford Bros. & Hitchings, Westfield, Ia., have found a recent addition to their foundry inadequate to the needs of their growing business, and have purchased a building erected for the Waterloo Self-Feeder & Pump Co.

The 3—B—S Stove Co., Beaumont, Tex., has been incorporated to operate a stove foundry. The incorporators are: E. W. Semple, A. R. Brown, Lon. A. Bernard and John H. Groocks. The company has purchased the plant of the Gem Stove Co., at West Point, Miss., which it intends removing to Beaumont.

The Jasper County Foundry & Machine Works, Carterville, Mo., has been incorporated with a capital stock of $24,000. The incorporators are: L. E. McDonald, A. W. Canada, E. F. McDonald and others.



'Everyone to Their Own Taste'

is what the woman said when she kissed the cow.

This Has Nothing to do With Flour

other than emphasize the fact that one grade of Flour will not suit every foundry.

We handle

Second Bakers, Low Grade, Paste, Piq-Cor, Seq-Cor and Red Dog Flours.

THE PIQUA FLOUR CO.

Piqua, Ohio, U.S.A.

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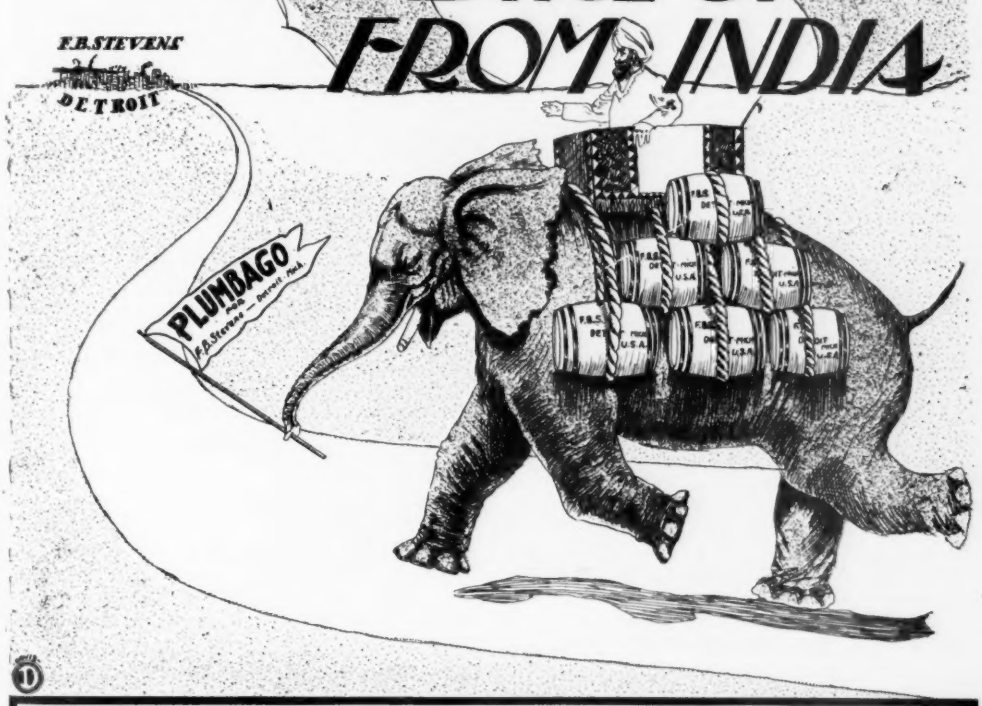
PLUMBAGO!

(The Genuine) DIRECT FROM INDIA



THE MINES OF CEYLON, East India, yield the best Plumbago in the world,—that is why I take the trouble to import it a distance of 12,120 miles. It is so superior that it is worth the trouble.

Genuine East India Plumbago gives to castings a handsome, smooth finish impossible to obtain in any other way. It also saves much time in cleaning and as a less quantity is needed, the reduction in cost is worth careful consideration.

One cask will convince you, as it has already convinced many others. I have letters enough to this effect to fill an ordinary cupola.

I will send a sample cask on approval; if not found to be satisfactory, it may be returned and I will stand freight both ways.

It is up to you to be convinced at my risk.

I am a specialist—you can buy everything for a foundry at my shop, but it will be the best there is. That is my specialty.

FREDERIC B. STEVENS
Detroit, Mich.

CLASSIFIED

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Advertisers' names are inserted under this heading at the rate of four classifications to each page advertisement carried regularly.

Abrasive Materials:
The Carborundum Co.....Niagara Falls.

Air Compressors:
American Air Compressor Co.....New York.
The Norwalk Iron Works Co....So. Norwalk, Conn.
Ingersoll-Rand Co.....New York.

Air Hoists:
Curtis & Co. Mfg. Co.....St. Louis.
Craig Ridgway & Son.....Coatesville, Pa.

Alloy:
Geo. G. Blackwell Sons & Co., Ltd.,
..... Liverpool Eng.

Alundum Wheels:
Norton Emery Wheel Co.....Worcester.

Analysis of Mixture:
W. J. Keep .....Detroit.

Anchors:
W. W. Lindsay & Co.....Philadelphia.

Binder for Cores:
Holland Linseed Oil Co.....Chicago.

Blackings:
The S. Obermayer Co.....Cincinnati.

Blowers:
B. F. Sturtevant Co.....Boston.
The Connersville Blower Co.....Connersville, Ind.
American Blower Co.....Detroit.

Blow-Hole Cement:
Shelton Metallic Filler Co.....Derby, Conn.

Brass Founders' Equipments:
The S. Obermayer Co.....Cincinnati.

Brass Melting Furnaces:
Hawley Down Draft Furnace Co.....Chicago.

Brass Melting Furnaces:
Oscar Barnett Fdy. Co. .....Newark.
Rockwell Engineering Co.....New York.

Brass Molders' Flasks:
The Adams Co..... Dubuque.

Brass Smelting Furnaces:
The Carborundum Co.....Niagara Falls.

Burners, Monarch Oil for Core Ovens and annealing:
The Monarch Engineering & Mfg. Co...Baltimore.

Casting Breakers & Trolley Systems:
Curtis & Co. Mfg. Co.....St. Louis.

Cement (Iron and Steel):
The Clark Cast Steel Cement Co....Shelton, Conn.
The Shanafelt Mfg. Co.....Canton, O.

Chain Blocks:
Yale & Towne Mfg. Co.....New York.
Hill & Griffiths .....Cincinnati.

Chaplets:
W. W. Lindsay & Co.....Philadelphia.
Burdick & Son.....Albany.
The Shanafelt Mfg. Co.....Canton, O.
J. W. Paxson Co.....Philadelphia.
Fanner Mfg. Co.....Clevelan l.
Samuel H. Caufman.....Chester, Pa.

Chemists:
The Metallurgical Laboratory.....Pittsburg.

Coal:
McKeefrey & Co.....Leetonia, Ohio.

Coke:
Rogers, Brown & Co.....Cincinnati.
McKeefrey & Co.....Leetonia, Ohio.
J. H. Hillman & Son.....Pittsburg.

Cores:
Brown Specialty Mach'y Co.....Chicago.

Core Binder:
The S. Obermayer Co.....Cincinnati.

Core Compound:
C. E. Mills Oil Co.....Syracuse.
Buffalo Fdy. Supply Co.....Buffalo.
Holland Linseed Oil Co.....Chicago.
J. W. Paxson Co.....Philadelphia.

Core Machines:
Brown Specialty Mach'y Co.....Chicago.
The Kent Mfg. Co.....Kent, Ohio.
Falls Rivet & Mach Co.....Cuyahoga Falls, Ohio.
Jones & Atwood.....Stourbridge, Eng.

Core Oven Recording Thermometer:
The Bristol Co.....Waterbury.

Core Sand Binder:
Amercan Glutrose Co.....Camden.

Core Ovens:
Hill & Griffiths.....Cincinnati.
J. S. McCormick Co.....Pittsburg.
Rockwell Engineering Co.....New York.
Atlas Car & Mfg. Co.....Cleveland.
Falls Rivet & Mach Co.....Cuyahoga Falls, Ohio.
Millet Core Oven Co.....Brightwood, Mass.
J. W. Paxson Co.....Philadelphia.

Corundum Wheels:
Norton Emery Wheel Co.....Worcester.

Cranes:
Pedrick & Ayer Co.....Plainfield, N. J.
Manning, Maxwell & Moore,.....New York.
Wilcox Mfg. Co.....Aurora, Ill.
Curtis & Co. Mfg. Co.....St. Louis.
Niles-Bement-Pond Co.....New York.
Maris Bros .....Philadelphia.
Pawling & Harnischfeger.....Milwaukee.
Craig Ridgway & Son.....Coatesville, Pa.
Whiting Fdy. & Equip't Co.....Harvey, Ill.
Northern Engrg. Works.....Detroit.

Cranes, Jib:
William Sellers & Co., Inc.....Philadelphia.

Cranes, Traveling:
William Sellers & Co., Inc.....Philadelphia.

Cranes, Wall:
William Sellers & Co., Inc.....Philadelphia.

Crucibles:
McCullough-Dalzell Crucible Co.....Pittsburg.
J. H. Gautier & Co.....Jersey City.
J. W. Paxson Co.....Philadelphia.
Ross-Tacony Crucible Co.....Philadelphia.
Jos. Dixon Crucible Co.....Jersey City
Robt. J. Taylor, Inc.....Philadelphia.

Crucibles: in Connection with Steele Harvey Furnaces:
The Monarch Engineering & Mfg. Co...Baltimore.

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We Cut Down Your Costs

A dozen *little* leaks in processes of manufacture, cost finding, stock accounting, etc., are more dangerous than a *big* leak. It is our business to go after the little leaks.

We increase production; we decrease cost---both of which are means of multiplying profits.

Our methods have increased production of many foundries, as well as of other industrial organizations as much as one-third.

Write us. The chances are we can benefit you.

GUNN, RICHARDS & COMPANY

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50 CONGRESS STREET, BOSTON
224 ST. JAMES STREET, MONTREAL

Cupolas:
Whiting Fdy. Equipment Co.....Harvey, Ill.
Northern Engrg. Works.....Detroit.
The S. Obermayer Co.....Cincinnati.
J. W. Paxson Co.....Philadelphia.
Byram & Co.....Detroit.

Cupola Hoists:
Craig Ridgway & Son.....Coatesville, Pa.

Dry Compound:
C. E. Mills Oil Co.....Syracuse.

Elevators:
Craig Ridgway & Son.....Coatesville, Pa.

Emery Wheel Stands:
The Adams Co..... Dubuque.

Engines:
American Blower Co.....Detroit.

Exhaust Fans:
B. F. Sturtevant Co.....Boston.

Facings:
Hill & Griffiths.....Cincinnati.
F. B. Stevens.....Detroit.
J. S. McCormick Co.....Pittsburg.
Jos. Dixon Crucible Co.....Jersey City.
Buckeye Milling Co.....Cleveland.
J. W. Paxson Co.....Philadelphia.
Moore Fencing Works.....Providence.

Fans:
American Blower Co.....Detroit.

Ferro-Manganese:
Rogers, Brown & Co.....Cincinnati.

Ferro-Silicon:
Rogers, Brown & Co.....Cincinnati.
Chas. G. Shepherd.....Buffalo.

Fire Brick:
J. H. Gautier & Co.....Jersey City.
Henry Maurer & Son.....New York.

Fire Clay:
J. H. Gautier & Co.....Jersey City.

Foundry Blowers:
P. H. & F. M. Roots Co.....Connersville, Ind.

Flasks:
Brass Founders' Supply Co.....Newark.

Flour:
The Buckeye Milling Co.....Cleveland.

Foundry Cars:
Atlas Car & Mfg. Co.....Cleveland.

Foundry Elevators:
Pedrick & Ayer Co.....Plainfield, N. J.
Curtis & Co. Mfg. Co.....St. Louis.

Foundry Engineering:
Geo. K. Hooper.....New York City.

Foundry Equipment:
Oscar Barnett Fdy. Co. .....Newark.
Tilghman-Brooksbank Sand Blast Co..Philadelphia.
Whiting Fdy. Equipment Co.....Harvey, Ill.
Edward J. Etting.....Philadelphia.

Foundry Facings & Supplies:
The S. Obermayer Co.....Cincinnati.

Foundry Ladle Cars:
C. W. Hunt Co.....W. New Brighton N. Y.

Foundry Pneumatic Rammers:
Chicago Pneumatic Tool Co.....Chicago.

Foundry Supplies:
The Osborn Mfg. Co.....Cleveland.
Cutter, Wood & Stevens Co.....Boston.

Furnace Cement:
J. H. Gautier & Co.....Jersey City.
Jas. Dixon Crucible Co.....Jersey City.

Furnaces: Rivet Heating with Oil or Gas:
The Monarch Engineering & Mfg. Co...Baltimore.

Furnaces, Steele Harvey Crucible Melting:
The Monarch Engineering & Mfg. Co...Baltimore.

Grinding Machinery:
Norton Emery Wheel Co.....Worcester.

Grinding Wheels.
Superior Corundum Wheel Co....Waltham, Mass.
Norton Emery Wheel Co.....Worcester.

Heating & Ventilating Apparatus:
American Blower Co.....Detroit.

Heating & Ventilating Systems:
B. F. Sturtevant Co..... Boston.

Hoists:
Niles-Bement-Pond Co.....New York.
Whiting Fdy. Equipment Co.....Harvey, Ill.
Northern Engrg. Works..... Detroit.

Industrial Ry. Equipment:
B. F. Sturtevant Co..... Boston.
The Atlas Car & Mfg. Co.....Cleveland.

Iron Cement:
Smooth-On Mfg. Co.....Jersey City.

Iron Flasks:
Oscar Barnett Fdy. Co.....Newark.

Iron Ore:
Rogers, Brown & Co.....Cincinnati.

Iron Paint:
Smooth-On Mfg. Co.....Jersey City.

Ladles:
J. S. McCormick Co.....Pittsburg.
Northern Engrg. Works.....Detroit.
The S. Obermayer Co.....Cincinnati.
J. W. Paxson Co.....Philadelphia.
Byram & Co.....Detroit.

Ladle Heaters:
Rockwell Engineering Co.....New York.

Linseed Oil:
Holland Linseed Oil Co.....Chicago.

Magnetic Separators:
Elm City Engineering Co.....New Haven.
Dings Electro Magnetic Sep. Co.....Milwaukee.

Manganese:
Kendall & Flick.....Washington, D. C.

Metal Patterns:
Chas. Herman & Son.....Sharpsburg, Pa.

Metallic Fillers:
Hill & Griffiths.....Cincinnati.
The Sheldon Metallic Filler Co.....Derby, Conn.
The Clark Cast Steel Cement Co.....Shelton, Conn.
J. W. Paxson Co.....Philadelphia.

Molding Machines:
Turner Machine Co.....Philadelphia.
Manning, Maxwell & Moore,.....New York.
Geo. F. Blake Mfg. Co.....New York City.
Henry E. Pridmore.....Chicago.
Oregon Fdy. & Mach Co.....Oregon, Ill.
The Adams Co.....Dubuque.
J. W. Paxson Co.....Philadelphia.
E. H. Mumford Co.....Philadelphia.

Molding Sand:
Buffalo Fdy. Supply Co.....Buffalo.

Mold Separator:
The Partamol Co.....New York.
J. W. Paxson Co.....Philadelphia.

Molders' Tools:
J. W. Paxson Co.....Philadelphia.
William Dobson.....Canastota, N. Y.

Oil for Cores (or Core Oil):
Holland Linseed Oil Co.....Chicago
C. E. Mills Oil Co.....Syracuse.
Buckeye Milling Co.....Cleveland.

CONTINUED ON PAGE 112.

Greatest Windmaker ever designed for cupola or any other use.

Costs more than other blowers
but saves the difference every month.

No hot bearings
No break-downs
No waiting for hot iron

J. B. & J. M. Cornell Co.

MANUFACTURERS

26th St. and 11th Avenue New York City

Blowers and Exhausters

Parting Compounds:
The Partamol Co.....New York.

Phosphorizers:
McCullough-Dalzell Crucible Co.....Pittsburg.

Phosphor Tin:
New Era Mfg. Co.....Kalamazoo.

Pig Iron:
Rogers, Brown & Co.....Cincinnati.
J. J. Mohr.....Philadelphia.
N. S. Bartlett & Co.....Boston.
F. A. Goodrich & Co.....Detroit.
Robert Field Sales Agency.....Cincinnati
J. K. Dimmick & Co.....Buffalo.
Dalton, Nash & Co.....New York.
McKeefrey & Co.....Leetonia, Ohio.
Dornhoff & Joyce Co.....Cincinnati.
Columbus Iron & Steel Co.....Columbus.
De Camp Bros. & Yule.....St. Louis.
Pilling & Crane.....Philadelphia.

Plumbago:
Hill & Griffiths Co.....Cincinnati.
F. B. Stevens.....Detroit.
J. S. McCormick Co.....Pittsburg.
J. H. Gautier & Co.....Jersey City.
Jos. Dixon Crucible Co.....Jersey City.
The S. Obermayer Co.....Cincinnati.
The Buckeye Milling Co.....Cleveland.
McCullough-Dalzell Crucible Co.....Pittsburg.
Pettinos Bros.....Bethlehem, Pa.

Plumbago Stopper Heads:
Ross-Tacony Crucible Co.....Philadelphia.

Pneumatic Foundry Appliances:
Ingersoll-Rand Co.....New York.

Pneumatic Hammers:
Dayton Pneumatic Tool Co.....Dayton.

Pneumatic Molding Machines:
Chas. Herman & Son.....Sharpsburg, Pa.

Portable Emery Grinders:
Stow Mfg. Co.....Binghamton, N. Y.

Positive Foundry Blowers:
P. H. & F. M. Roots Co.....Connersville, Ind.

Positive Pressure Blower:
The Connersville Blower Co.....Connersville, Ind.
P. H. & F. M. Roots Co.....Connersville, Ind.

Pressure Blowers:
The Connersville Blower Co.....Connersville, Ind.
American Blower Co.....Detroit.

Riddles:
The Adams Co.....Dubuque.
J. W. Paxson Co.....Philadelphia.

Roots Blowers:
P. H. & F. M. Roots Co.....Connersville, Ind.

Rotary Blowers:
The Connersville Blower Co.....Connersville, Ind.
P. H. & F. M. Roots Co.....Connersville, Ind.

Rotary Sand Sifters:
Chas. Herman & Son.....Sharpsburg, Pa.

Rubber Sheet Packing:
Smooth-On Mfg. Co.....Jersey City.

Sand Blast Machinery:
Tilghman-Brooksbank Sand Blast Co..Philadelphia.
J. W. Paxson Co.....Philadelphia.

Sand Mixing Machines:
William Sellers & Co., Inc.....Philadelphia.
Falls Rivet & Mach Co.....Cuyahoga Falls, Ohio.

Sand Sifters:
Hanna Engrg. Works.....Chicago.
International Steam Pump. Co....New York City.
Gould & Eberhardt.....Newark.

Separators:
Dings Electro Magnetic Sep. Co.....Milwaukee.

Shovels:
F. B. Stevens.....Detroit.
H. Channon .....Detroit
J. W. Paxson Co.....Philadelphia.

Silica Wash:
Buffalo Fdy. Supply Co.....Buffalo.

Smooth-On:
Smooth-On Mfg. Co.....Jersey City.

Snap Flasks:
The S. Obermayer Co.....Cincinnati.
J. W. Paxson Co.....Philadelphia.
Diamond Clamp & Flask Co.....Richmond, Ind.
The Adams Co.....Dubuque.

Soapstone Facing:
F. B. Stevens.....Detroit.

Soil Pipe Equipment:
Oregon Fdy. & Mach Co.....Oregon, Ill.

Sprue Cutters:
The F. B. Shuster Co.....New Haven.
Oscar Barnett Fdy. Co. .....Newark.
Waterbury Farrell Fdy.....Waterbury, Conn.

Steel Barrels:
Kilbourne & Jacobs Mfg. Co.....Columbus.

Steel Castings:
The Otis Steel Co., Ltd.....Cleveland.

Stoppers:
McCullough-Dalzell Crucible Co.....Pittsburg.

Stove Plate Facings:
Buffalo Fdy. Supply Co.....Buffalo.

Stove Trimmings:
The Fanner Mfg. Co.....Cleveland.

Talc:
F. B. Stevens.....Detroit.

Testing Machines:
W. J. Keep .....Detroit.

Thermit Process:
Goldschmidt Thermit Co.....New York.

Traveling Electric Hoists: Trolley Track:
Maris Bros .....Philadelphia.
Pawling & Harnischfeger.....Milwaukee.

Tumbling Barrels:
Falls Rivet & Mach Co.... ..Cuyahoga Falls, Ohio.
J. W. Paxson Co.....Philadelphia.
Waterbury Farrell Fdy.....Waterbury, Conn.

Tumbling Mills:
The Adams Co..... Dubuque.

White Metal Melting Furnaces:
Rockwell Engrg. Co.....New York.

Wire Brushes:
The Osborn Mfg. Co.....Cleveland.

Wire Straighteners:
The F. B. Shuster Co.....New Haven.
Geo. F. Blake Mfg. Co.....New York City.
International Steam Pump. Co....New York City.

UNDISPLAYED ADVERTISEMENTS

FOR SALE

Undisplayed advertisements will be inserted under this head at 40 cents per line each insertion.

FOR SALE.—One No. 8 Whiting cupola, in good condition. Immediate delivery. PENNSYLVANIA MALLEABLE COMPANY, Pittsburg, Penna.

FOR SALE.—One No. 7 Root Blower and one fan blower in good condition, for sale cheap. Can be seen at the Hay Foundry & Iron Works, Newark, N. J.

Facings of all kinds. Prices everlastingly lowest, qualities everlastingly best. BERG MINING CO., N. Y.

German Black Lead. Prices everlastingly lowest, quality everlastingly best. BERG MINING CO., N. Y.

Ceylon Plumbagos. Prices everlastingly lowest, quality everlastingly best. BERG MINING CO., N. Y.

East India Silver Lead. Prices everlastingly lowest, grade everlastingly best. BERG MINING CO., N. Y.

Prices everlastingly lowest, goods everlastingly best. Plumbagos and Leads. BERG MINING CO., N. Y.

FOR SALE.—Two Tumbling Mills in good condition. For full particulars address, Keith Furnace Company, Des Moines, Ia.

FOR SALE—Large tumb'er barrel, dimensions 8 ft. 3" x 5 ft. 1" inside, for particulars address Geo. H. Smith Steel Casting Co., Milwaukee, Wis.

FLUOR SPAR.—Lump and Gravel. Special Qualities. Delivered Eastern Ports. Enquiries solicited. DRABBLE BROS., Mineral Merchants, Matlock, England.

FLUOR SPAR.—Every grade. Quotations delivered anywhere. Cheapest suppliers. Address GEO. G. BLACKWELL SONS & CO., Ltd., Liverpool, Eng., or agents Penna. Salt Mfg. Co., Pittsburg, Pa.

FOR SALE.—No. 4 Green Pressure Blower in use about two years, good as new. Address, SALEM BRASS & IRON MFG. CO., Salem, N. J.

A POUND of Fluor Spar Crystals thrown on to a badly acting heat will save a lot of trouble and possibly profanity on the part of the melter as well as increasing the tensile strength of the casting by volatilizing the sulphur. A barrel of these crystals—pure, crystallized fluor spar—weighing between 500 and 550 pounds will be delivered freight paid at any railroad station east of the Mississippi river upon receipt of $12.00. We have supplied many of the larger southern pipe foundries for a number of years with this splendid product in can lots decreasing their pipe breakage from a large percentage of the castings to practically nothing. It will certainly pay any foundryman to have a barrel of crystals on the charging floor open and ready for use. We guarantee 99½ per cent efficiency. Address ROBERTS & COMPANY, Rome, Tennessee.

FOR SALE or TO RENT. Brass Foundry, Bridgeport, Conn., opposite freight station and within five hundred feet of water-front. Property consists of 113.4 square rods. Main building 60 x 200 feet and equipped with crucible (21) furnaces, trolleys, etc., fireproof pattern safe, core room and supply sheds, stamp mill and well yielding 200 gallons per minute. Location also valuable as warehouse. Address R. H. W. Box 1358 N. Y.

SUB-LET BRICK WAREHOUSE, Bridgeport, Conn., two stories and high basement, with elevator, 75 x 150 feet on lot 100 x 150 feet directly opposite freight station, N. Y., N. H. & H. R. R., present lease expires April 1907. Address R. H. W., P. O. Box 1358, N. Y.

FOR SALE—Foundry in good manufacturing city in Iowa. Owner other business, a bargain. Address Box 550, THE FOUNDRY, Cleveland, Ohio.

FOR SALE:—Well equipped foundry and machine shops in mining district of 30,000 inhabitants. Owner wishes to retire. Address Box 545, THE FOUNDRY, Cleveland.

FOR SALE.—No 2½ Whiting Cupola, in excellent condition. Price, $125.00.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.

HELP WANTED.

Undisplayed advertisements will be inserted under this head at 25 cents per line each insertion.

WANTED.—One second-hand crusher for extracting brass from ashes. Address MR. SMITH, care W. D. Allen Mfg. Co., 151 Lake St., Chicago.

FOREMAN WANTED.—For small stove foundry. State where employed and wages expected. Address MOBILE STOVE WORKS, Mobile, Ala.

WANTED.—Brass Moulder for bench and floor. Steady employment for good workman. Foundry near New York. Must be willing to work in open shop. Address Box 556, THE FOUNDRY, Cleveland Ohio.

WANTED.—First class foundry foreman with executive ability to take charge of foundry employing two hundred hands. Medium and light, floor, bench and machine molding. Good salary to competent man. Address with reference, Box 541, THE FOUNDRY, Cleveland, Ohio.

FOUNDRY FOREMAN WANTED.—An experienced foreman is wanted for an iron foundry running about 25 tons per day, medium weight castings. A steady position to the right man No one need apply unless he is first-class and has had considerable experience. Address Box 555, THE FOUNDRY, Cleveland, Ohio.

WANTED.—Young man not over thirty years of age, for position of assistant superintendent in an old established stove foundry employing about seven hundred men. Must be a practical moulder and good all around mechanic. Salary small to begin with, but good growing position for man who can "Make good." Address Box 560, THE FOUNDRY, Cleveland, Ohio. Give qualifications and references.

WANTED:—Foreman for pattern making department, who thoroughly understands wood and metal pattern making and the management of men. We also want to employ a first-class melter to take charge of our melting furnaces. He need know nothing in regard to the mixture of iron, but must understand the working of furnaces and making repairs. We also want a good furnace brick-layer. Steady employment to the right parties. Address WHITELEY MALLEABLE CASTINGS CO., Muncie, Ind.

WANTED:—Foundry foreman to take full charge of our foundry, who would purchase an interest in the business of from $1,000 to $6,000. We have a good opening for a capable man desiring to get into business. Address giving age, experience, etc. Address THE PEERLESS FOUNDRY CO., Indianapolis, Ind.

CONTINUED ON PAGE 114.

WANTED—Sales Agent located in New York, for Foundry in Rhode Island, handling Loam, Dry and Green sand castings. Must be first-class man and able to control large business. State terms to Box 561, THE FOUNDRY, Cleveland, Ohio.

WANTED.—Competent brass founder, one who thoroughly understands mixing and melting of metals and foundry practice. Steady employment and good salary. State age and salary expected. Address W. M. B., 405 James St., Syracuse, N. Y.

WANTED.—Foundry Foreman for Brass Foundry, good position for right man state experience. Address, Box 559, care THE FOUNDRY, Cleveland, O.

FOREMAN wanted for western foundry, working eight to ten molders. State experience. Address Box 553, THE FOUNDRY, Cleveland, Ohio.

POSITIONS WANTED

Undisplayed advertisements will be inserted under this head at 25 cents per line each insertion.

SITUATION WANTED:—A competent foundry foreman desires change. Experienced in foundry details and has the executive ability to produce results in your foundry. Address Box 548, THE FOUNDRY, Cleveland.

POSITION.—As foundry foreman, understands stove and register molding. Ten years experience as foreman at same; best of reference and can engage at once. Address Box 542, THE FOUNDRY, Cleveland.

Young man, 22 years old, desires position as assistant to superintendent in manufacturing plant having foundry attached. Experienced; not afraid of responsibilities and willing to look after details. References furnished. Address BOX 512, THE FOUNDRY Cleveland, O.

FOUNDRY SUPT.—Open to engagement after Jan. 1st, would like to correspond with parties desiring services of man competent of taking full charge of Foundry in all its details, 14 years' experience as foreman and superintendent. Full particulars and references upon request. Address Box 547, THE FOUNDRY, Cleveland.

WANTED.—Position, Foundry foreman, 15 years experience. Heavy medium or light machinery. Expert with cupola. Mix by analysis. Handle men and molding machines successfully. References. Address Box 546, THE FOUNDRY, Cleveland.

POSITION as chemist by college man, competent to take charge of foundry laboratory. A. F. HOBBIE, 241 Sawtell Ave., Cleveland, O.

YOUNG and up-to-date Foundry Foreman now having charge of a boiler foundry with 45 molders, desires to change his location after Jan. 1st, 1906. Capable of adjusting prices for both the day and piece worker, and can handle men to the best possible advantage. Address Box 543, THE FOUNDRY, Cleveland.

SITUATION WANTED.—Expert Malleable Iron Cost Accountant—familiar with all the technical details in bench and floor foundries and finishing shops; can also supervise the mixing of the iron by chemical analysis for both air furnace and cupola, as well as the annealing thereof. Will consider a proposition. Address Box 554, THE FOUNDRY, Cleveland, Ohio.

SITUATION WANTED.—By a thorough and practical foundryman, with fifteen years experience in dry and green sand, and chilled castings, as superintendent or foreman. Good executive ability and capable of handling a large force. Can devise and introduce labor saving equipment to reduce cost. Have a practical knowledge of drafting, pattern shop and machine shop practice. Strictly temperate, a worker and willing to prove it. Address, BOX 515, THE THE FOUNDRY, Cleveland, O.

FACTORY SUPERINTENDENT, aggressive and diplomatic with a record of 18 years good practical experience in the production of large and varied lines of metal products, desires a change of location about January fifteenth. Thoroughly familiar with every detail of modern foundry practice, (Gray, Mall or Steel). An organizer of help that produces permanent and satisfactory results. Some of the best references in the country to prove it. Address Box 544, THE FOUNDRY, Cleveland.

POSITION WANTED:—By Foundry Foreman, general jobbing shop preferred. Am acquainted with latest methods and can handle men to advantage. Reference given. Address Box 549, THE FOUNDRY, Cleveland, Ohio.

POSITION as foundry foreman or assistant; 18 years' experience; first-class molder and core maker on hot water boilers, furnaces and stove plate, strictly temperate, best of references. Box 498, THE FOUNDRY.

WANTED.—Position by young, energetic foundry foreman of experience and temperate habits. Well up on light and heavy castings and molding machines. Address Box 552, THE FOUNDRY, Cleveland, Ohio.

WANTED.—Position as foundry foreman. Can give good reference, has had 20 years' experience on light and heavy work, also understands molding machines. Will invest a small amount of money if desired. Address Box 551, THE FOUNDRY, Cleveland, Ohio.

Money-Saving Foundry Books

The Cupola Furnace, by Edward Kirk - -	$3.50
The Iron Founder, by Simpson Bolland - -	2.50
American Foundry Practice, by Thos. D. West -	2.50
Metallurgy of Iron and Steel, by Thos. Turner -	4.50
Brass Founders Alloys, by J. F. Buchanan - -	2.00

Sent postpaid by The Foundry, Cleveland, O.

N.E. Foundrymen Metal Finishers and Machinists N.B.

WE carry a good stock of supplies such as you are using every day in your shops. Why not draw your requirements in this line from near home? You will pay no more, and will find it more convenient. To give you an idea of the kind of goods our stock is made up of we will mention a few principal items, viz:

FOUNDRY

By carload—Foundry Lead, Foundry Flour, Foundry Molasses, and Moulding Sand. Tinned Chaplets from $\frac{1}{8}$ to $\frac{5}{8}$ usual sizes to 18 inches long. Full line Moulders' Brushes, Shovels, Riddles, Rammers, Bellows, Crucibles and foundry supplies; also Pattern Letters, Fillet, Dowels, etc.

METAL GRINDING, POLISHING AND PLATING

Sterling Emery Wheels, all sizes and grades $1\frac{1}{2}$ in. to 20 in. Best Turkish Emery (all grades---all sized packages.) Emery Glue. Tripoli, Crocus and other compounds. Nickel Anodes and Salts. Felt, Leather and other Polishing and Buffing Wheels. Platers' Brushes. Lye. Cyanide and full line Chemicals and Supplies. *Complete Electro-plating Outfits installed.*

MACHINE SHOP

Drills, Reamers, Taps, Dies, Cutters, Mills, Screw-plates, Files, Hack Saws, Bolts, Nuts, Screws, Washers, Lathe and Drill Chucks, Vises, Wrenches, Hammers, Mallets, Clamps, Dogs, Lathe Tools, Babbit, Belting, Waste. Brown & Sharpe's and Starrett's Fine Tools, etc., etc.

CUTTER, WOOD & STEVENS COMPANY

68-70 Pearl Street,
BOSTON, MASS.

Alundum Grinding Wheels

ARE THE LEADERS

The BEST WHEEL for your FOUNDRY
Made in Any Size or Shape
Free and Fast Cutting --- Uniform Quality
Write us for Particulars and Catalogs

MANUFACTURED ONLY BY

Norton Emery Wheel Co.

WORCESTER CHICAGO

Agents in all large cities